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ABSTRACT

This volume comprises a series of 6 manuals which provide an exhaustive reference on methods and procedures for the evaluation, planning, and management of all types of college and university facilities. Specific topics covered are: (1) the impact of curriculum changes on physical facilities; (2) classroom and class laboratory facilities; (3) office and research facilities; (4) academic support facilities; (5) general institutional facilities; and (6) foundations of facilities planning and management. (HS)

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HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

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Preliminary Field Review Edition
November, 1970

Technical Report 14

SPACE ANALYSIS MANUALS: FIELD REVIEW EDITION

TECHNICAL REPORT 14

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Planning and Management Systems Division
Western Interstate Commission for Higher Education
In cooperation with The American Association of Collegiate Registrars and Admissions Officers

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The Western Interstate Commission for Higher Education (WICHE) is a public agency through which the 13 western states work together

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. . . to expand the supply of specialized manpower in the West.

. . . to help universities and colleges improve both their programs and their management.

. . . to inform the public about the needs of higher education.

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The program of the WICHE Planning and Management Systems Division was proposed by state coordinating agencies and colleges and universities in the West to be under the aegis of the Western Interstate Commission for Higher Education. The Planning and Management Systems Division program proposes in summary:

To design, develop, and encourage the implementation of management information systems and data bases including common data elements in institutions and agencies of higher education that will:

- provide improved information to higher education administration at all levels.
- facilitate exchange of comparable data among institutions.
- facilitate reporting of comparable information at the state and national levels.

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WICHE
Western Interstate Commission for Higher Education
Planning and Management Systems Division

ED057751

November, 1970

TO: THE HIGHER EDUCATION COMMUNITY

This Field Review Edition of the Higher Education Facilities Planning and Management Manuals is being sent to the chief executive officers of all colleges, universities, and state facilities commissions and coordinating agencies. It is also being sent to a selected list of specialists in the fields of higher education administration and facilities planning and management.

The purpose of these manuals is to provide an exhaustive reference on methods and procedures for the evaluation, planning, and management of all types of college and university facilities. The manuals have been written by a small staff with additional inputs coming from a limited number of specialists in relevant fields.

The time has come to let the user react to the product and to point out those areas where the usefulness of the manuals is impaired by problems of organization or content. Please skim the manuals yourself and circulate them within your institution to those who might be in the best position to review them critically and constructively. Any comments and suggestions on how the manuals might be improved or organized to serve the needs of the institutional user will be appreciated. Present intent is to bind the six manuals individually and combine them in a single loose-leaf binder, but this is subject to change on the basis of your suggestions.

Written comments are needed by January 15, 1971, and may be in the form of letters or as notations in the manual which can be returned. The suggestions received from throughout the higher education community will be incorporated in a final edition which is scheduled for publication in March, 1971. You will receive a revised copy at that time.

Inasmuch as substantial changes may occur, it is not recommended that the procedures presented within the manuals be applied at this time. Please study this version and forward your critique. This edition should be destroyed when the final edition is published.

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Division

Thomas R. Mason
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Principal Investigator
Space Analysis Manuals Project

HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

SPACE ANALYSIS MANUALS PROJECT

Preliminary Field Review Edition

November 1970

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In cooperation with the

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INTRODUCTION

THE HIGHER EDUCATION FACILITIES PLANNING AND MANAGEMENT MANUALS

THE SPACE ANALYSIS MANUALS PROJECT

The purpose of the Higher Education Facilities Planning and Management Manuals is to provide an elementary handbook of methods and procedures for the evaluation and planning of college and university facilities.

The effort which has resulted in the development of these manuals (Space Analysis Manuals project-SAM) was initiated in 1968 by the American Association of Collegiate Registrars and Admissions Officers. In 1969, the project was merged with the Planning and Management Systems Program of the Western Interstate Commission on Higher Education. It was funded by a grant from the Office of Education Bureau of Research.

The WICHE PMS Program is charged with the development of common systems for information exchange and reporting and of analytic models for higher education planning and management. The integration of the Space Analysis Manuals project with the WICHE PMS Program was designed to insure that the terms, definitions, and analytical concepts utilized in the facilities manuals would correspond as closely as possible to those being developed in the WICHE PMS Program.

This general introduction to the manuals describes the background of the Space Analysis Manuals project, outlines the philosophy that has governed their preparation, maps the structure of the manuals, and suggests the ways in which the manuals should be used.

HISTORY AND BACKGROUND OF THE SPACE ANALYSIS MANUALS PROJECT

The Problem

Over the past two decades the expanding demand for higher education and the broadening functions of colleges and universities have required a massive increase in investment in physical plant. As the costs of providing higher education facilities have become more burdensome, the need for more effective planning and utilization of facilities has become a major concern of institutional administrators and the governmental and private agencies that must provide capital funds for buildings. Increasingly rigorous requirements for justification of facilities needs, have emerged.

The allocation of resources for building facilities is increasingly dependent upon the measurement of current utilization and the documentation of projected requirements. Greatly improved methods are needed for use at the institutional level for the measurement, evaluation, assignment, scheduling, and projection of building space. Although a wide variety of methods and approaches have been developed and applied in many institutions and state systems, there has been no single, up-to-date reference source available which describes a comprehensive and consistent set of methods for the management and planning of building space requirements.

The objective of this project has been to develop and publish a series of manuals describing workable methods of analysis, assignment and projection of building space in colleges and universities. The techniques described and illustrated in the manuals are designed for direct and relevant application to the administrative operations of the individual institution. Institutions of different size, program structure, and program composition have widely varying requirements; these variations are accommodated in the space management and planning methods described in the manuals. At the same time, the methods correlate with and supply the needs of statewide and federal agencies for valid aggregated information about the current and projected needs for higher education facilities funds.

Background: The Appraisal of Facilities Utilization

The appraisal and improvement of the utilization of college facilities has always been a concern of the institutional administration. This concern has led to a long series of journalized studies of the problem which began in the 1920's. Widespread interest in these studies, however, was not aroused until the facilities shortages became critical in the years immediately following World War II. At that time, the American Association of Collegiate Registrars and Admissions Officers (AACRAO), the originator of this project, sponsored the first of its many major contributions to the literature dealing with the prediction and evaluation of facilities needs.

In 1953, AACRAO published the predictions of College Age Population Trends, 1940-1970 which called attention to the massive increase expected in college enrollments. This was followed in 1954 by The Impending Tidal Wave of Students, which emphasized the magnitude of the post-war growth in higher education demand.

Because the college registrar has been responsible, in the majority of institutions, for the assignment and scheduling of instructional facilities, AACRAO in 1957 sponsored the preparation and publication of the Russell-Doi Manual for Studies of Space Utilization in Colleges and Universities. As a follow up to the Russell-Doi manual, the Association sponsored the Doi-Scott compilation of instructional space utilization studies which was published in 1960 as Normative Data in the Utilization of Instructional Space in Colleges and Universities. These studies (now out of print) have been widely used in the United States and abroad as the basis for evaluating and estimating instructional space requirements.

The search for better ways of utilizing existing facilities and of justifying the need for additional facilities was a major focal point of many institutional and statewide surveys of higher education in the 1950's. The model research done in the California and Western Conference Cost and Statistical Study in 1954-55 and the widely influential Restudy of the Needs of California in Higher Education, published in 1955, expanded the techniques of facilities evaluation and forecasting.

The nationwide inventory of building facilities conducted by the U. S. Office of Education in 1957-58 provided the first comprehensive national data on the scope and nature of higher education facilities. The data compiled in that study subsequently formed the basis for estimating future national needs which led to the Higher Education Facilities Act of 1963. The Higher Education Facilities Act, with its requirement for the creation of state commissions to manage the allocation of the federal funds, has established the machinery for a coordinated state-federal system of information gathering for the assessment of facilities requirements.

In recent years, the development of cooperative state-federal programs has intensified the demand for more comprehensive and consistent information about the operations and needs of higher education. The Swanson-Arden-Still report, Financial Analysis of Current Operations of Colleges and Universities (Office of Education Cooperative Research Project No. 1853, Institute of Public Administration, The University of Michigan, Ann Arbor, Michigan, 1966) was an extensive survey and analysis of methods of reporting and evaluating fiscal needs. The Henle report, Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities (National Science Foundation NSF 67-15, 1967) describes methodologies for establishing a comprehensive management information system for colleges and universities.

The inauguration of the Higher Education General Information Survey (HEGIS) by the U. S. Office of Education in 1966 reflected the growing need for consistent and comprehensive information on the whole range of higher education functions. This federal reporting system has clarified the need for uniformity and consistency in the terms, definitions, and classification of higher education data. Among several efforts in this direction, the Office of Education sponsored the preparation of a Higher Education Facilities Classification and Inventory Procedures Manual (OE 51016, 1968) that has gained widespread adoption by institutions and state higher education agencies.

Under the Higher Education Facilities Act, the Office of Education has provided funds through the state higher education facilities commissions for improving the comprehensive statewide planning and projection of higher education facilities requirements. These activities will have a major influence on determining the future need for investment in higher education facilities.

Objectives of the Manuals

The Space Analysis Manuals project has emerged from this background as a reflection of the need to provide college and university officers with a reference source of the best available methods for the evaluation, planning, and management of facilities. The project was initiated by the American Association of Collegiate Registrars and Admissions Officers in 1968 with the intention of updating the Russell-Doi space utilization manual; the scope of the project has been expanded since to include more comprehensive planning and management techniques.

Basically, the objective of these manuals is to compile a series of methods for use at the institutional level for evaluating the current capacity of building facilities, managing the use of space, and projecting building space requirements.

The manuals include procedures for all types of academic facilities that can be subjected to formalized and generalized methodologies. These include instructional facilities, offices, libraries, the more common types of research space, and typical service and support facilities. Some types of facilities do not lend themselves to generalized analytical or projection methods and must be dealt with as specialized types. The manuals take cognizance of these types of facilities by inclusion of descriptions of how planning for such unique types of facilities may be approached.

PHILOSOPHY AND ASSUMPTIONS GOVERNING DEVELOPMENT OF THE MANUALS

The content, organization, and tone of these manuals have been heavily influenced by the character of the intended audience. They have also been affected by the desire on the part of the authors to convey a sense of the proper context for the various procedures and methodologies discussed.

Throughout the development of these manuals, it has been assumed that the primary audience will be composed of registrars, deans, business officers, faculty members, and other college and university personnel who are not specialists in facilities planning and management. Further, it has been assumed also that this primary audience will be found in new and/or smaller institutions, both public and private. The manifestations of these assumptions are evident throughout the manuals. Among the more significant are those discussed in the following paragraphs:

First, the manuals are designed specifically to address those aspects of facilities planning which are pertinent at the institutional level. With the exception of one section, the manuals are directed to the institutional user. (In Section 5.0 of Manual Six a system of general planning criteria is proposed which is intended for use at state- and system-wide levels.)

In keeping with the institutional orientation of these manuals, they are written around the philosophy that the existing diversity in American higher education is healthy and should be endorsed and nurtured. None of the procedures discussed in these manuals is so rigid as to engender homogeneity forcibly or to preclude a place for institutional individuality. On the contrary, the procedures specifically call for input of factors which represent a statement of institutional policy wherever such factors are appropriate.

Second, some of the procedures are presented and illustrated in great detail. Especially with regard to classroom and class laboratory facilities, many different factors affect the facilities requirements and must be considered in the planning process. The relationships between these factors, in many cases, are very subtle. As a result, the procedures to be followed in planning such facilities have been described in painstaking detail in an effort to enhance the understanding of the more subtle, but very important, basic relationships. In those instances in which the relationships are more straightforward, the procedures are generally described in less detail.

Third, it is recognized that many of the newer and smaller institutions do not have a computer capability or extensive data files in machine readable form. As a result, extreme care has been taken to insure that the methodologies presented do not require a computer capability as a prerequisite to the use of the procedures. Instead, the development of the techniques presented has been predicated on a requirement that they be capable of being carried out using nothing more than a pencil and paper and a calculator. For a large institution, the application of these techniques without benefit of a computer would create a task of mammoth proportions. While a computer may be extremely useful at certain stages, there is nothing in the design of the procedures which makes the availability of a computer a basic requirement.

Further, since collection and manipulation of input data is an expensive and time-consuming undertaking, the procedures are designed to use those data most commonly collected and maintained wherever possible. Admittedly, some of the procedures call for use of data which are not ordinarily contained within an institution's data system. However, the incidence of such occurrences has been kept at a minimum as a result of a conscious attempt to base the planning procedures on that data most readily acquired.

The content and tone of these manuals also have been shaped by a strongly-held conviction on the part of the authors that facilities planning must be viewed in the broader context of a total planning and management system. Reference is made throughout the manuals to the fact that facilities planning, which will reflect the future needs of the institution faithfully, can only be accomplished as a sequel to the development of a detailed program plan for the institution.

While these manuals were originally intended to be restricted to discussion of facilities planning and management methodologies, the current lack of material describing program planning methodologies and the need for such methodologies prior to initiation of facilities planning has prompted inclusion of a rather detailed discussion of program planning and analysis techniques in Manual Six. Inclusion of this material, in large part, is necessitated by the frequency that the development of facilities planning techniques are carts placed ahead of program planning horses. Other projects, currently in progress within the WICHE Division of Planning and Management Systems, are designed to provide the program planning base so fundamental to the use of the facilities planning procedures presented herein. A great deal of effort has been expended in an attempt to adopt the facilities planning procedures to the anticipated forms of the WICHE PMS products, many of which are only in the initial steps of development. The terms, definitions, and analytic concepts in the manuals do follow those in the WICHE PMS Program Classification Structure (Preliminary Edition, June, 1970), the Data Elements Dictionaries (First Edition, April, 1970), and the Resource Requirements Prediction Model-I (Version Two). In turn the Space Analysis Manuals Project staff has contributed to the development of those products. In all probability, some changes in procedures will be required as a result of future developments in those projects dealing with program planning. These changes, however, should be minimal.

Finally, the content of these manuals has been influenced strongly by the philosophy that they can be of maximum use if the procedures presented deal with the problems as they are recognized currently rather than as they may develop in the future. As a result, these manuals represent a compilation of the existing state of the art. The methodologies selected for presentation are geared almost wholly to the more traditional forms of education and the standard measures of educational activity (e.g., student credit-hours, weekly student-hours).

Movement away from the traditional forms and measures of education are noticeable now, and undoubtedly, will continue at a quickening pace. Such variations as heavier use of independent study, computer-assisted instruction, pass-fail grading, and elimination of prescribed courses have become common-place. Nevertheless, the bulk of the institutions in which this document should find its greatest utility have not yet broken sharply with the past and probably will not in the foreseeable future. It is the hope that by directing these manuals to the users' existing problems, the transition, if it comes, may be made easier.

In an effort to show how many of these procedures may have to be modified by significantly altered instructional techniques, Section 5.0 of Manual One contains an essay on how a radically different form of curriculum and course scheduling affects the use and projection of facilities requirements are discussed. This essay also serves to introduce another assumption upon which the development of these manuals has been based. It deals quite thoroughly with the notion that considerations of aesthetics and quality of the academic environment are equal (or exceed) in importance to those considerations limited to the determination of the quantities of space required. As of now, there are no satisfactory ways to measure quality or appropriateness of the environment. It is more a matter of individual perception than of fact. Since no concrete guides to measuring quality of space on its functional adequacy exist, discussion of these subjects has been omitted from the discussions purposely. This in no way implies that these considerations are of no consequence. Rather, it recognizes the fact that decisions regarding them are strictly subjective judgments which must be made at the institutional level.

It has been assumed that the manuals, although primarily directed at the neophyte in the small institution, nevertheless will be useful to the more sophisticated physical planners and administrators in the larger institutions. None of the methodologies included are invalid for use at any particular institution simply because of the institution's size.

ORGANIZATION OF THE MANUALS

There are six manuals in this edition of the Higher Education Facilities Planning and Management Manuals. Manual One deals with the introductory material, the essay on the Colorado College Plan, and the general reference material. Included in the latter category are the Table of Contents, the Glossary, the Index, and the Bibliography. The information contained in Manual One pertains to all subsequent volumes.

Manuals Two through Five contain the presentation of the methodologies recommended for evaluating and projecting the requirements for the various types of space. Manual Two deals with classroom and class laboratory facilities. Manual Three treats office and research facilities. Manual Four discusses academic support facilities (e.g., library, computer, audio-visual, exhibition facilities). Manual Five serves as a catch-all and includes discussions on the variety of types of space not dealt with in the preceding three manuals (e.g., athletic-physical education facilities, recreation facilities, lounges, dorms, dining halls and student health facilities).

Manual Six includes discussions of those topics which are related to the methodologies of facilities planning and are necessary to the basic understanding of the use of these techniques, but which are not, in the narrow sense, considered to be facilities planning methodologies. Of particular importance in Manual Six are the sections dealing with program planning and analysis. Section 5.0 contains a proposal for a system of generalized planning criteria appropriate for state-level evaluation of the outputs of institutional facilities planning systems. Finally, Section 6.0 of this manual describes the place of facilities planning within the overall master planning process and the activities associated with implementing a facilities plan. Section 6.0 is devoted primarily to re-emphasizing the relationships between academic and facilities planning with the objective of helping to insure that the techniques presented in great detail in the previous manuals will be thoughtfully and appropriately employed and integrated into a comprehensive planning process.

STRUCTURE OF THE MANUALS

A generally consistent structure has been adhered to in presenting the facilities planning methodologies (Manual Two through Five). First, the manuals have been structured around types of space. The methods appropriate to each of the more important types of space are discussed separately in these manuals. For each type of space, two sets of procedures are discussed, one dealing with evaluating the capacity of existing facilities and the other describing the techniques to be used in projecting future requirements for that particular type of space. Where potentially beneficial to the user, the projection methods to be used by a new institution and those more relevant to an existing institution are presented separately.

A basic pattern has been followed in presenting the methodologies for evaluating capacities of existing facilities and projecting future requirements. Common to this pattern are the following topics:

- Facilities Data Required:

  A listing of the information about existing facilities which must be available before the user can use the procedures.

- Program Data Required:

  A listing of the information regarding courses, students, and teaching loads which must be available before the procedures can be used. The Program Planning section (Section 2.0 of Manual Six) is addressed specifically to projecting program data.

- Utilization Assumptions Required:

  A listing of various assumptions which must be expressed quantitatively prior to application of the methodologies. These assumptions are the mechanism through which institutional variations are registered.

- Procedures:

  A step-by-step explanation of the procedures to be followed in evaluating current capacity or projecting future requirements for each type of space.

- Illustration:

  A numerical example is included to illustrate the procedures.

- Discussion and Comments:

  Wherever appropriate, special problems on variations which can occur are singled out for detailed discussion.

- Unit floor area criteria:

  Ranges of values of unit floor area criteria are presented for all types of space for which they are appropriate.

The material is structured so as to tell the users what data must be available before a start is made, the procedures to be followed in using the data for evaluative or projective purposes, and, in addition, illustrates guideline values of unit floor area criteria which the user can employ initially in the absence of values directly applicable at his particular institution.

This structure, of course, is not followed in those cases for which no satisfactory planning methodologies are available. In such cases, a general discussion of the problems associated with planning such facilities is provided.

Finally, the structure includes different levels of detail (two levels in most cases). For each type of space a very detailed set of procedures for evaluating capacities and projecting requirements is discussed. In addition, a more generalized set of procedures which requires less detailed data also is presented. In each case, the detailed procedures require input data which specifically reflects the institution's characteristics. The general methods are less sensitive to institutional variation and must grow out of a prior use of the more detailed methods if they are to be used with any degree of confidence.

USE OF THE MANUALS

These manuals comprise a handbook of facilities planning methodologies. Furthermore, it is intended that they be used as a handbook. Initially, the user should skim the totality of the material presented in order to grasp its breadth and depth. In application, it is expected that seldom, if ever, will the entire range of subject matter be of concern to the user at one time. Rather, it is expected that the user will search out those sections which apply specifically to his particular problem of the moment and use only that limited amount of material of immediate concern.

Since these manuals are intended to be used as a handbook, a certain amount of repetition in the material is present. This has been done knowingly and in an effort to make the material of maximum benefit to the user and to minimize the amount of cross-referencing required.

The user should take particular heed of the following caveats:

- These manuals represent a handbook of techniques and methodologies. They are in no way to be construed as establishing nation-wide planning standards. The quantitative values of such things as utilization criteria and unit floor area criteria are intended to be only illustrative. No user should borrow these numbers as a basis for developing an institutional plan without a great deal of review and analysis.

- The user should develop a healthy, skepticism toward the procedures as well as the quantitative information provided. The methodologies presented, especially the generalized methods, may be inappropriate for use because of some unique characteristic of a particular institution. As shop-worn as the warning may seem, the user must convince himself that the procedures are, in fact, appropriate for use in his particular situation before he applies them.

- The user must realize that these techniques are confined to dealing with quantitative aspects of the evaluation and projection processes. The all-important qualitative evaluations and decisions rest solely on the subjective judgment of the user.

- Above all, the user must keep facilities planning in perspective and in its proper context. Facilities planning must be recognized as an outgrowth of academic or program planning and the techniques presented in these manuals must be used with that point in mind. The reader is well advised to digest the material presented in Section 6.0 of Manual Six (Synthesis: The Planning Cycle) prior to use of any of the material discussed.

In summary, these manuals should not be viewed as the "books with all the answers." It is impossible to write a document which considers all the special cases and all the unique reasons for inter-institutional variations. At best, the manuals present materials which should be of use to some of the users some of the time. They can serve as a guide and as an aide, but they cannot serve as a substitute for an intelligent and knowledgeable institutional planner. They cannot do his job for him, but it is hope that they make his job easier.

NEW DIMENSIONS IN SPACE MANAGEMENT

THE IMPACT OF CURRICULUM CHANGES ON FACILITIES*

INTRODUCTION:

The formulas and measures employed in modern space management have proven their worth in a variety of ways: as a means of permitting institutional officers to learn more about the operation of their colleges and universities; to make more rational decisions about their existing space; to plan more effectively for future needs; and to interpret the complex world of academic facilities to state legislatures and other important constituents. However, like any powerful instrument, the devices of space management are capable of being employed indiscriminately, to the detriment of the institution. Perhaps most importantly, the user of modern space management techniques must always bear in mind that the changing nature of the academic enterprise demands that the formulas and measures need constant re-examination. At their best, they are an accurate reflection of academic purposes and economic realities; at their worst, they are rigid exercises in irrelevant measurement. The modern manager can insure that his techniques are in good working order in three important ways.

- He can analyze periodically the substance of his academic and extra-curricular programs. He may well discover that important shifts in faculty or administrative policy have placed new demands on the physical space of the institution.

- He needs to modify his measures and formulas to make certain that they are in accord with changes that may have occurred in other areas of the institutional program.

- He must determine regularly whether his measures and formulas, in fact, are giving him the data they are supposed to yield.

An illustration of the changing nature of institutional space (and of the need for modifications of managerial techniques) can be found at Colorado College in Colorado Springs, a private liberal arts institution with a faculty of 125 and a student body of 1,650. On September 1, 1970, Colorado College adopted a new comprehensive plan that substantially changed the space requirements of the institution and the philosophy of space use. Essentially, the new plan involved an almost complete revision of the concept of a course, a classroom, a contact hour, a unit of credit, scheduling procedures, and definitions of academic and non-academic space. While Colorado College did not employ highly sophisticated techniques of space management to begin with, nevertheless, it has had to alter virtually all of its conventional approaches in order to convert to the new plan. To the extent that the college employed rationalized measures and formulas, they too have been subject to drastic revision.

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*This section was written by Dr. Glenn Brooks, Professor of Political Science and Faculty Assistant to the President, and Mr. Malcome Ware, Administrative Assistant to the Dean, Colorado College, Colorado Springs, Colorado.

THE COLORADO COLLEGE PLAN

When Colorado College began a systematic review of its program in 1968, the institution followed an academic schedule very typical of American higher education. Faculty members normally taught three courses. Students took from four to six courses each semester. The credit hour was the standard measure of a student's progress toward his degree as well as a measure of a faculty member's teaching load. Classroom, office, and research space was planned and assigned by rough rules of thumb. For a faculty of 125, forty to fifty classrooms were used routinely for courses, with relatively low rates of utilization and no heavy pressure or competition for space. Classes usually met for fifty minutes, three days a week, and on some occasions for seventy five minutes, two days a week. Residential and other auxiliary spaces were organized in the conventional manner. In short, virtually everything about the traditional operation of Colorado College could have been analyzed according to the conventional measures of higher education.

As Colorado College students, faculty, and administrators probed more deeply into their programs, however, they arrived at some conclusions that had far-reaching implications. They decided that the standard multiple course system was not as productive for students or faculty as it should be. Everyone felt overly fragmented in his academic efforts; the worthy objectives of liberal education were too often subordinated to immediate, conflicting demands. Courses had to fit the semester format with little room for expansion or contraction. Normal complications of multi-course scheduling restricted the daily routine of students and professors.

Colorado College then decided on a new course plan which abandoned many established assumptions. In place of the regular multi-course system, a plan was adopted under which students normally take only one or two courses at a time, and faculty members match the efforts of students by teaching only one or two courses. Courses vary in length from three and one-half weeks to ten and one-half weeks. They also vary in format; some are full time courses for the student and his professor. Others are "half courses" in which a student takes two longer courses. Still others are interdisciplinary in which two or more professors work full time with a group of students. To make the system even more complex, courses of varying length and format run simultaneously throughout the year. Thus, one professor and one group of students may work intensively together in a full time three and one-half week course; another professor teaches a full-time seven week course; others teach two ten-and-one-half week half courses. The reason for the complex modular schedule is that departments had different needs for their course sequences. Biologists, for example, wanted to offer short, full-time, field courses in the fall and spring. On the other hand, the political scientists needed maximum mobility during election periods.

Once the College had abandoned the multiple course system entirely, it was also able to disregard daily class schedules altogether. With a high level of trust among faculty and administrators, the college simply allows the faculty member to meet his class as often and as long as he feels is necessary. Since there are no conflicting courses for the student or the professor, they are free to establish their own timetables for the entire period of a course. One compromise was with the "half courses" in which a student may enroll, and a faculty member teaches, two at a time. To resolve possible conflicts between the daily schedules of half courses, the college created three time tracks--eight to ten, ten to twelve, and one to three. Each half course is assigned a time track. Within that track, the professor is free to meet his class whenever he chooses.

The change in course formats and schedules entailed a fundamental change in the concept of a classroom. Each course was guaranteed a space that it could use exclusively for the entire period of the course, and which, within the limits of security and finances, could be set up by the professor and students in the manner they judged most desirable for their purposes. Many members of the faculty had concluded that ordinary classrooms were among the least desirable places for learning on their campuses, with straight, impersonal rows of chairs and sterile fixtures. By giving a professor and his students extensive control over their room, the designers of the plan hoped to foster the creation of more responsive environments for learning.

The concern of the college for improving the general quality of their physical campus environment also led them to make substantial alterations in the extra-curricular program of the college. They designed an integrated "leisure program" to provide a contrast and a balance to the relatively intensive courses. Within this program were included many of the ordianry activities and events of the undergraduate campus: athletics, clubs, lectures, performances, and symposia. But the plan also assumed that students would need additional outlets for their creative energies. Accordingly, the leisure program includes new means of support for experimental student projects such as film-making and music, for student-initiated seminars and non-credit courses, and for a widespread program of college-supported, non-credit arts and crafts.

The new plan also involved changes in the role and use of residence halls. Viewing the housing of the student as a central element in his education, the plan encouraged new styles of residential living, with greater emphasis on student self-government, experimental coed housing, and more academic activities in residence halls. For example, a number of the new courserooms are located in small residence hall lounges, not only because the additional courseroom space was needed, but also because the plan called for a better combination of academic and residential affairs. Dormitory lounge areas may also be used for arts and crafts activities. In effect, the idea of a lounge as a large room with sofas may undergo a substantial transformation under the new program.

Still another change in the concept of physical space has been occasioned by the added mobility encouraged by the Colorado College Plan. Since students and faculty have virtually complete control over their timetables, they also are in a position to control their movements on and off campus. Many courserooms, therefore, have become little more than bases of operations, because much of time is spent off campus or in other parts of the campus. An introductory geology course, for example, works in the field each day, returning in the late afternoon. An archaeology course met in its courseroom for the first week but spent the next two weeks on a dig in southeastern Colorado. They then returned to their courseroom for laboratory analysis of their findings. Courses in literature, classics, and history frequently have migrated between the courseroom, the professors' homes, and other unlikely meeting places (such as the backroom of a popular, local bar). These floating courses quite possibly may become the rule rather than the exception as students and professors discover fresh ways of exploiting their opportunities for learning. Yet the practice of moving around clearly places new stresses on the traditional notion of classrooms.

Finally, the Colorado College Plan seeks to bring the entire physical environment of the institution into better line with central educational purposes. The courserooms are an obvious area in which significant redesign will occur. But the college has also begun to re-examine its exterior spaces to determine how well they support the academic, leisure, and residential programs of the plan. The conversion to the modular course schedule for example, produced notable changes in the flow of student traffic across the campus. No longer is there an hourly surge of students moving from one class to another. However, the campus was designed implicitly for the standard pattern of student movement. In the long run, then, the college may modify its campus walkways, lighting, and landscaping to produce an environment more conducive to small-group gatherings, less emphasis on large scale movement from one location to another.

In summary, the Colorado College Plan has produced changes in academic, extra-curricular, and residential programs which, in turn, have far-reaching implications for the management of physical space for the entire campus. It involved changes in the length, format, and schedule of courses; changes in the concept of credit, contact hours, and teaching loads; a redesign of conventional classrooms; as well as redefinitions of academic and non-academic spaces. Freedom of scheduling encouraged many classes to shift from one place to another rather than to stay in a single courseroom. New concepts of environmental design have arisen from the conversion to the plan.

MAJOR PHYSICAL SPACE PROBLEMS

The problems encountered in the transition to the new mode of operation are a commentary on the importance of, as well as the limitations of, modern space management. Conversion to the Colorado College Plan has confronted space managers with three types of difficulties:

- They have had to determine whether enough space and furniture could be found to accommodate the increased requirements.

- They have had to assess the potential costs of such a conversion.
- They have had to deal with some of the delicate political problems that emerge when established campus territories are threatened by change.

On the face of it, there appeared to be insufficient courserooms. Under the old plan, only forty to fifty courserooms were assigned regularly. The new plan called for as many as one hundred and twenty courserooms at one time. (For a faculty of 125, at least five would not be teaching at a given time.) Yet, like so many institutions of higher education, Colorado College did not have an accurate and thorough inventory of all physical space on its campus, and there was no quick way of knowing whether additional space was available. The Colorado College Planning Office began such a survey in the summer of 1969. At the outset, the surveyors made several crucial assumptions:

- Any enclosed space on the campus, whether in a classroom building or not, was potentially usable for a courseroom. This included secondary residence hall lounges and even fraternity house lounges.
- Revenue-producing areas in residence halls would be used only as a last resort.
- Special-use areas, such as laboratories probably would need to retain their original use, but that most other spaces could be modified in function.

One highly competent undergraduate student undertook the task of walking from room-to-room in every building on the campus with note cards and tape-measure. Quickly, he began to discover that a great many rooms in regular classroom buildings were actually idle, even though the registrar's office showed that they were being used by departments. In some instances, a perfectly respectable classroom was being used virtually as a storage area. In other cases scheduled classes were not being used by the class assigned there. Outside of regular classroom buildings, a similar story unfolded. Cozy secondary lounges, relatively free from residence hall traffic, were scarcely being used during daytime hours. Inviting corners of large lounges also appeared to be possibilities for small course groups. Fraternities expressed an eagerness to bring courses into their houses in order to forge more effective bonds with the rest of the college community. Once the old assumptions were changed--that is, once the formal definition of a classroom was abandoned in favor of a more versatile notion--courseroom space began to materialize in all corners of the campus.

Soon the Planning Office could account for a hundred and ten potentially workable spaces. This was still short of the optimum number, but it made the courseroom idea seem feasible to skeptics. Even so, the Planning Office could not give answers to several important questions. First, although the total number of rooms was close to being adequate, there was no ready way to determine whether the distribution of course enrollments would match the distribution of course room sizes.

This courseroom problem was allayed slightly by a policy decision made by the faculty: under the new college plan, no course would be permitted to enroll more than twenty-five students without consent of the full faculty.*

With such a policy, the college was in a position to make educated guesses about the number of rooms that would be overly large, the number that would be suitable only for very small classes, and the number that could accommodate any course within the predicted range of one to twenty-five. Here the matching process became more troublesome, for it became apparent that many classroom buildings had been planned under the orthodox assumption that class sizes would remain what they had been in the past, with numerous classes from twenty-five to fifty students and a smaller number of upper division classes of five to twenty.

At this stage of the analysis, other possibilities came to light. The college could predict that a small number of courses would have only four or five students. These courses, it seemed, could meet in the professor's office rather than in a separate courseroom. Assuming that ten percent of all courses would have these small enrollments, the college immediately added another twelve meeting places to its list of potential courserooms. But such an assumption made still another inroad into the traditional concept of classroom space, and further blurred the kinds of physical space distinctions contained in most space analyses.

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*This limitation of class size to 25 or less probably sounds like sheer luxury to administrators in large institutions. Yet, Colorado College was able to establish this maximum with a student-faculty ratio that is comparable to most other institutions--about 14 to one. In most colleges, class size is considerably larger than the student-faculty ratio because the faculty teach only two or three courses at once, while students take four to six courses. This expands the actual average class size to a level well above the student-faculty ratio. For example, if a college sets three courses as a standard teaching load, but retains five courses as the established student course load, and if the student faculty ratio is 15 to one, it means that their average class size will approximate 25, not 15. But if the faculty course load remains at three courses and the student course load is dropped to three courses as well, the average class size will drop to fifteen without adding a single member to the faculty. This, in essence, is what Colorado College did. They established a one-to-one ratio of student and faculty effort: if a faculty member teaches one full-time course, his students take only that course; if he teaches two half-courses, students will take one-half course from him and one-half course from another professor; and if two professors teach a joint course, they agree to take on a proportionately larger number of students. Thus, average class size dropped from about 25 to 15, and the faculty was able to impose a maximum size of 25 on all but the jointly-taught courses.

The college also realized that some courses would be away from the campus and would not require courserooms. The added mobility of the plan thus tended to ease the space pressures slightly. Moreover, the planners discovered that some professors preferred to share a single space in order to take advantage of certain facilities. Again, this had the effect of creating additional space.

Working through the list of faculty and courses, the college planners finally came to the conclusion that the courseroom idea could be made to work. They never would have reached that stage, however, if they had been confined to their old definitions of classroom space.

Closely related to the courseroom problem was the question of furniture. Would there be enough chairs and desks to accommodate the entire faculty and student body sitting down in their courserooms at one time? Once again, a careful inventory of campus furniture revealed that there were more than enough seats to go around. As in the case of the courseroom survey, there remained the question of whether the conventional types of furniture available--the customary tablet-arm chairs being most numerous--would be suitable for the style of the new courserooms.

The alternative to using old furniture would be to purchase very expensive new seminar-type furniture. Two factors ruled out this possiblity. First, the college was reluctant to spend scarce funds on items that would duplicate what was already available. Secondly, the college administration decided that the college needed at least two years of experimentation under the new plan before making long-term commitments on remodeling or refurnishing. In the experimental years, they reasoned, they would be in a position to try out a variety of course room arrangements that would give needed data on the most effective arrangements, and possibly avert costly mistakes arising from premature judgments.

Both on courserooms and furnishings, the decison to carry on with the old facilities generated inventiveness among students, faculty, and administrators. Students, for example, began to question the assumption that any ordinary chairs were needed for courserooms. Many of them preferred cushionss and a comfortable rug. The faculty, somewhat more conservative, still tended to call for chairs and blackboards but, in many cases, began to move away from the idea that a standard classroom would be the best model for their new courseroom. Once again, when the old assumptions were modified, the standard measures of classroom space and furnishings became largely inapplicable.

The planning constraints--no major remodeling or refurnishing--substantially lessened the financial impact of the conversion to the new plan, but cost considerations nevertheless played an important role. Even before the plan was approved by the faculty, departments were queried about the possible financial implications of a conversion. It became evident that three types of expenditure were potentially involved:

1) new expenditures that would have been necessary with or without the conversion to a new plan;

2) expenditures that were desirable but not essential to the conversion; and

3) expenditures that were made necessary by the conversion to the plan.

As the dean and his associates analyzed the projections, they reached the conclusion that only some $100,000 was required as an increase under the new plan. Roughly a fourth of that amount concerned changes in the physical plant; the rest was earmarked mainly for special equipment and staff support. Some of the additional outlay was a once-only expenditure. The biology department, for example, felt that it needed additional microscopes to accommodate the new plan, and needed to partition one large laboratory in order to create spaces for two courses rather than one. With the financial picture reasonably well outlined, Colorado College administrators felt that they could survive the physical implications of the conversion.

But physical facilities at Colorado College, like most institutions, are not allocated purely on the basis of technical considerations. Faculty members, directors of residence halls, and students themselves develop strongly proprietary attitudes toward rooms and buildings they have occupied for long periods of time. The most highly rationalized system of space allocation may falter if the feelings of users are not properly taken into consideration. For this reason, space planners at Colorado College engaged in long discussions with the occupants of existing space to work out the details of the shift. For the most part, they found departments skeptical but willing to give up certain spaces, partly because the entire college was involved in the conversion and cooperation was the order of the day. A less comprehensive change might well have been more troublesome, since some departments would have maintained the status quo while others converted to a different style of operation.

One of the most delicate problems in the transition was the manner of assigning courseroom space to departments. One idea was to have the registrar assign courserooms in each block of the calendar, shifting faculty members around from block to block according to the needs of their courses. This procedure met with strong objections from the faculty. Some professors felt that their teaching plans made it desirable for them to remain in one courseroom for an entire year or at least for a semester. They wanted, for example, to set up the room with decorations, books and reference materials that could be used from course to course. They were reluctant to invest considerable time and energies in fixing up a courseroom if they might be shifted in the next block. On the other hand, if each faculty member kept a courseroom for long periods, and yet had courses that varied in enrollment, the problem of adjusting courserooms to proper class size would become acute, since there were simply not enough all-purpose courserooms to go around.

The solution was to assign sets of courserooms to each department for a semester, with the understanding that the rooms would be assigned to individual professors according to a departmentally established criteria. Most departments do, in fact, shift courserooms from block-to-block according to needs of the course. One department, however, follows a strict seniority system. The senior professors get their choice, and the junior men take the leftovers. Since, for many faculty members, the most desirable rooms are those close to the professor's office in his own building, the younger professors in that department are destined to spend much of their time in residence hall lounges and other courserooms outside the ddepartment's building area. In spite of some imbalances resulting from the system of cluster assignment of courserooms to departments, the procedure does allow departments to make decisions about courserooms according to needs of their courses, and for the most part the procedure seems to work. The point, for purposes of space management, is that any system of allocation that gives the faculty some sense of control over facilities is likely to be more acceptable to the faculty than one which makes arbitrary assignments, however rationally conceived, from a central, administrative office.

CHANGES TO THE PHYSICAL ENVIRONMENT

The analysis of space for the Colorado College Plan answered basic questions about the availability of courserooms and furniture, the financial implications, and the political realities of a conversion. The analysis solved some of the strictly quantitative problems, but the qualitative questions still had to be faced; how can the college adapt its old physical environment to serve the best interests of the new educational process? How can professors and students arrange themselves in the courserooms--or in other areas of the campus--for maximum educational effect? To what extent will the environment of the courseroom actually shape the outcome of the educational activities in the room? Do straight rows of chairs and a lectern in front produce relations between students and professors which are distinct from those in which the furniture is arranged in semi-circles or in lounge style?

To get a better idea of the relationship between the courseroom and the learning that occurs within it, the college decided to create six experimentally designed courserooms. According to a Planning Office memorandum;

> "The main purpose of the new designs is to provide a series of interesting alternatives to conventional classrooms and seminar rooms at the outset of the new plan. In this way, faculty and students will have the opportunity to experience different and perhaps better arrangements for learning. Otherwise, we could possibly find ourselves saddled with courserooms that are as barren as the classrooms we now have.
>
> The experimental designs may also give us useful ideas about long range remodeling schemes. It seems inadvisable to attempt major remodeling now; we have neither the money nor the inspiration that we will need.
>
> Finally, the designs will be an exercise in imaginative, low cost arrangements that may avert more costly--and perhaps less useful--remodeling now or later."

With those purposes in mind, Mr. Malcolm Ware, a recent graduate of the college, assumed responsibility for the development of the experimental courserooms.

He worked with several assumptions in mind:

- Students, faculty, and administration would be consulted actively throughout the experimental construction.
- Designs would vary from room to room to achieve maximum experimental effect.
- Existing furniture, including conventional armchair desks, would be incorporated into some of the designs to determine whether better uses could be found for present inventories of furniture.
- Everything in the experimental rooms would be capable of rearrangement with a minimum of effort.
- Costs would be restricted to approximately $300 per room, which meant that used furniture, pirated from unorthodox sources such as auctions, would be used rather than new equipment.
- Students and faculty using the rooms would be encouraged to make changes according to their particular needs, and would be asked to evaluate their reactions to the experimental rooms.

Working within these rather severe constraints, Mr. Ware and a group of student volunteers spent part of the summer of 1970 consulting good-natured local architects about inexpensive and imaginative designs, locating furniture that could be adapted to the courserooms, and working out the actual designs of the six rooms. By the end of the summer, the style of the rooms was falling into place and had become the subject of campus conversation. One thing was certain: the rooms do not fit the conventional mold. One room in the social sciences building has been divided into two areas by means of platforms which raise an entire section of the room a foot above the others. (The platforms were donated by a contractor). A rich lavender rug graces the platform, and comfortable, if slightly threadbare, sofas and easy chairs make the platform into a study and discussion area. The other part of the room consists of a semi-circular arrangement of ordinary desk chairs, with a large cable-spool table in the center and beaverboard paneling around the walls for posting items of interest to the class. The other rooms differ considerably in detail, but most share design features which go against the grain of much contemporary space planning. First, the room designs do not assume that everyone must sit in a chair at all times. Cushions, rugs, and platforms are considered to be potential sitting places as well, even though sufficient chairs are always available if needed. Second, the rooms demonstrate that straight rows of chairs are not necessary for maximum student-station utilization; on the contrary, it may well be that these unorthodox designs, with students and professors arranged together in more initimate collegial style, may also require less square footage of space. Third, the experimental rooms frequently abandon existing fluorescent lighting in favor of warmer, incandescent lighting from inexpensive floor lamps. These lights also serve to draw smaller groups of students into particular areas of the rooms rather than to accentuate the full class as the predominant group. In fact, the rooms clearly convey the suggestion that classes should be able to ebb and flow between the full group, smaller groups within the course, and individual activity. Conventional classrooms permit almost nothing but activities of the full class.

Although at this writing, it would be premature to make any generalizations about the success or failure of the experimental designs, it is apparent that the rooms have begun to effect the users of the rooms and the users of conventional courserooms as well. Students and faculty in the experimental rooms use them for a variety of purposes: regular classes, small group study, informal meetings, and individual socializing. This multiple-use confounds the formal definition of classroom space, and any formulas that might be applied to Colorado College utilization would require modification.

People in the experimental rooms also display an unusually proprietary attitude toward the rooms. When a sofa and chair were stolen from one room early in the course, the students were angred when they learned that "their furniture" was missing. Within one day, the student grapevine located the furniture in an off campus apartment and the offenders themselves returned the furniture without a word from the administration. Janitors report that the experimental rooms are invariably free of cigarette butts and trash, while conventional rooms continue to be littered. More importantly, students and faculty report that they can work well in the rooms, although they cannot say with certainty that the arrangements have made a fundamental difference in the quality of learning.

The experimental courserooms have also exercised a subtle influence on users of conventional courserooms. A number of students and faculty have decided to decorate and rearrange their rooms at their own expense. Even where there are no decorations, straight rows of chairs are gradually giving way to less formal arrangements as the faculty experiment with new learning modes. This, in turn poses a novel question for space managers: how far should students and faculty be permitted to go in changing the character of courserooms? Should they, for example, be able to paint a room if they felt it was too institutional in color? In the past, most schools have accepted the belief that the administration had the responsibility for planning, maintaining, and modifying the classrooms. But different educational approaches such as the one at Colorado College may require a revision of some of those established procedures, as students and faculty develop more incentive, as well as more good reasons, to manage their own class facilities. Indeed, the winds of change may reach many quarters of physical space management at most institutions of higher education, and the institutions that fail to anticipate such changes may find themselves in difficulty.

IMPLICATIONS FOR FUTURE FACILITIES MANAGEMENT

Let us assume that a space manager is about to begin an evaluation of existing classroom capacity as outlined in the early chapters of this manual. Properly, he would expect to begin by determining the number of weekly room-hours and weekly student-hours that can be accommodated in existing classrooms. But, if an institution is contemplating significant revisions in its academic program, the evaluator quickly will find himself faced with several perplexing questions. What can be defined as an "existing classroom" if academic planners are eyeing new kinds of spaces in residence halls, fraternity houses, and even faculty offices? After that question is satisfactorily answered, he soon faces others. What constitutes a room-utilization rate in each courseroom when the nature of that utilization is no longer confined to short, formally scheduled class periods? Here the space manager might be tempted to conclude the formal meeting is the most important of the various activities, and to assign heavier weight to conventional course periods simply because they bear more resemblance to established styles of class activity. Yet it may well be that other activities (e.g., group study and research) will assume greater value in education, and utilization studies will be required to adjust their measures accordingly. In a similar vein, the concept of a student-station, or a weekly student-hour may be subject to modification as a result of new academic programs. If the courseroom idea were more widely adopted, it might also mean that measures of reserach, residential, and classroom space would require multiple measurements of the same space--x hours for research, y for residential use, and z for course use.

Under the fire of educational reform, still other time-honored constants of space measurement may be no longer applicable. The Colorado College Plan effectively has eliminated the contact hour as a meaningful unit of academic measurement. It also be replaced the customary student-credit hour with a new unit of credit based upon the number of weeks a student spends in a course. Similarly, the definition of a teacher's load has had to be converted to the number of blocks taught rather than the number of contact hours per week. Such revisions still permit the use of standardized formulas, but the ingredients of those formulas will have to be changed significantly.

The concept of a course is another commonplace in space management that may be forced to yield to academic change. Greater emphasis on interdisciplinary studies, independent work, nonscheduled courses, varying credit, and elastic time periods, may render the measure of "the course" as difficult as many other variables. Even within traditional course programs, it is well known that the standard indices of the credit-hour or the length of the course may reveal very little about the amount of work done by a student or professor, or the amount of learning that goes on. The course as a unit of measurement, however, has always been a convenient, if deceptive, device. It may be less handy if educational research continues to demonstrate that the official contact hour may be one of the least significant measures of learning and teaching.

Finally, educational reforms may call for a reexamination of the utility of learning facilities on a scale yet unimagined. If, as some have contended, regular classrooms are unhelpful if not highly aversive to effective learning, the space manager could find that many of his own planning assumptions are no longer accepted by the faculty or students. If such an impasse develops, the academic community will be forced to make difficult and sometimes costly choices. Does the institution brings its physical facilities into accord with educational objectives? Or will those objectives be accommodated to the realities of the physical environment of the campus? Such a choice is not easy. A simplistic decision to remodel facilities could be taken in a hasty and ill-conceived manner. Fads and fashions are widespread in academe, and the likelihood that experimental programs will come and go is great. Somehow there must be a steady, responsible feedback between the academician and the space manager in a manner that permits gradual adjustment of space needs to proven reforms in academic affairs. The space planner should also anticipate counterpart changes in non-academic elements of campus life, with their own consequent demands on the facilities of the institution.

In short, the formulas and measures that have evolved out of the painstaking efforts of administrators and experts are valuable implements for any institution of higher education. But they could become irrelevant or even counterproductive if they are employed without the most assiduous regard for the movements in higher education which, ultimately, may require a recasting of the entire philosophy of physical space on the American campus.

GLOSSARY

TERM	DESCRIPTION
Academic Program	Designates a broad area of study such as the physical sciences.
Academic Rank	Institutional categorization of faculty positions. For the purpose of these manuals, this is an institutionally defined variable.
Academic Specialty	A reasonably specific academic offering such as organic chemistry.
Academic Unit	An organizational unit such as the chemistry department.
Appointment Percentage	Percentage of a full time appointment, normally stipulated in the appointment contract.
Armory Facilities	A room (or area) used by ROTC units. This category includes indoor drill areas, rifle ranges, and special-purpose military science rooms.
Armory Facilities Service	A room which directly serves an Armory Facility as an extension of the activities of such a facility. This category includes supply rooms, weapons rooms, etc.
Assembly Facilities	A room designed and equipped for dramatic, musical, devotional, or livestock judging activities. This category includes rooms generally referred to as theaters, auditoriums, concert halls, arenas, chapels, and (livestock) judging pavilions. Seating area, stage, orchestra pit, chancel, arena, and aisles are included in Assembly Facilities.
Assembly Facilities Service	A room which directly serves an Assembly Facility as an extension of the activities of such a facility.

GLOSSARY (continued)

TERM	DESCRIPTION
Assembly Facilities Service (continued)	This category includes check rooms, coat rooms, ticket booths, dressing rooms, projection booths, property storage, make-up rooms, costume storage, green rooms, and control rooms.
Assignable Square Feet	The sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant, including every type of space functionally usable by an occupant (excepting Custodial Area, Circulation Area, and Mechanical Area).
Athletic Facilities Spectator Seating	The seating area used by students, staff or the public to watch athletic events. Included in this category are permanent seating areas in fieldhouses, gymnasiums, and natatoria.
Athletic-Physical Education Facilities	A room (or area) used by students, staff, or the public for athletic activities. Included in this category are rooms generally referred to as gymnasiums, basketball courts, handball courts, squash courts, wrestling rooms, swimming pools, ice rinks, indoor tracks, indoor "fields", and fieldhouses.
Athletic - Physical Education Facilities Service	A room which directly serves an Athletic - Physical Education Facility as an extension of the activities in such a facility. Included in this category are rooms generally referred to as locker rooms, shower rooms, coaches rooms, ticket booths, dressing rooms, equipment supply rooms, first aid rooms, skate sharpening rooms, towel rooms, etc.
Audio-Visual, Radio, TV Facilities	A room or group of rooms used in the production and distribution of instructional media. This category includes rooms generally referred to as TV studios, radio studios, sound studios, graphics studios, and similar rooms.

GLOSSARY (continued)

TERM	DESCRIPTION
Audio-Visual, Radio, TV Facilities Service	A room which directly serves an audio-visual, radio, or TV Facility as an extension of the activities in such a facility. Included in this category are rooms generally referred to as film library, tape library, control room, video tape recorder room, property storage, recording rooms, and engineering maintenance rooms.
Average Room-Utilization Rate ($\overline{RUR}$)	The average number of hours per week all rooms of a given type are used. $\text{Room-Utilization Rate} = \dfrac{\text{Total Weekly Room-Hours}}{\text{Total Number of Rooms}}$ $\overline{RUR} = \text{Average WRH per room}$
Average Section Size ($\overline{SS}$)	$\text{Average Section Size} = \dfrac{\text{Total Weekly Student-Hours}}{\text{Total Weekly Room-Hours}}$ $\overline{SS} = \text{Average Students per room}$
Building Programming	The process by which a generalized set of specifications for a proposed facility is developed. Includes determination of the amounts of each type of space to be included in the building and the functional interrelationships between these spaces.
Capital Development Program	A program outlining the capital construction projects to be initiated, their relative priorities, and the estimated costs of each project. A statement of the capital resources required to accomplish an institution's goals and objectives.
Central Food Stores	A central facility for the processing and storage of foods used in residence facilities and food facilities. This category includes food storage areas, lockers, cold rooms, refrigerators, meat processing areas, and similar facilities located in a Central Food Stores building.

GLOSSARY (continued)

TERM	DESCRIPTION
Central Laundry	A central facility for washing, drying and ironing of linens, uniforms, and other institutional material.
Circulation Area	That portion of the gross area which is required for physical access to some subdivision of space.
Class Laboratory	A room used by regularly scheduled classes which require special - purpose equipment for student participation, experimentation, observation or practice in a field of study. A Class Laboratory is designed and/or furnished with specialized equipment to serve the needs of a particular area of study for group instruction in regularly scheduled classes. The design and/or equipment in such a room normally precludes its use for other areas of study. Included in this category are rooms generally referred to as teaching laboratories, instructional shops, typing laboratories, drafting rooms, band rooms, choral rooms, (group) music practice rooms, language laboratories, (group) studios, and similar specially designed and/or equipped rooms if they are used primarily for group instruction in regularly scheduled classes.
Class Laboratory Hour of Instruction	One hour spent by one faculty member in contact with a scheduled class laboratory section. Also known as a class laboratory weekly contact-hour.
Class Laboratory Service	A room which directly serves a Class Laboratory as an extension of the activities of the class laboratory. Included in this category are balance rooms, cold rooms, stock rooms, dark rooms, equipment issue rooms, animal rooms, greenhouses, and similar facilities which serve a Class Laboratory.
Classroom	A room used by classes which do not require special-purpose equipment for student use. Included in this category are rooms generally referred to as lecture rooms, lecture-demonstration rooms, seminar rooms, and general purpose classrooms. A Classroom may be equipped with tablet arm chairs

GLOSSARY (continued)

TERM	DESCRIPTION
Classroom (continued)	(fixed to the floor, joined together in groups, or flexible in arrangement), tables and chairs (as in a seminar room), or similar types of seating. A Classroom may be furnished with special equipment appropriate to a specific area of study if this equipment does not render the room unsuitable for use by classes in other areas of study.
Classroom Hour of Instruction	One hour (or period) spent by one faculty member in contact with a scheduled classroom course or section. Also known as a classroom weekly contact-hour.
Classroom Service	A room which directly serves a classroom as an extension of the activities of the classroom. Included in this category are projection rooms, cloak rooms, preparation rooms, closets, and storage if they serve a classroom.
Clinic Facilities (non-medical)	A room used for diagnosis and/or treatment of patients in a program other than medicine (human or veterinary), dentistry, and student health care. Included in this category are rooms generally referred to as patient examination rooms, testing rooms, consultation rooms. Clinics are typically associated with such educational areas as psychology, speech and hearing, remedial reading, and remedial writing.
Clinic Facilities Service (non-medical)	A room which directly serves a Clinic as an extension of the activities in a Clinic. Included in the category are waiting rooms, observation rooms, control rooms, records rooms, and similar supporting rooms.
Conference Room	A room used by non-class groups for meetings. A Conference Room may be equipped with tables and chairs, lounge-type furniture, straight-back

GLOSSARY (continued)

TERM	DESCRIPTION
Conference Room (continued)	chairs, and/or tablet arm chairs. It typically (but not necessarily) is assigned to a department for its use. It is distinguished from such Classroom Facilities as seminar rooms, lecture rooms, and general classrooms because it is used primarily for activities other than (scheduled) classes.
Conference Room Service	A room which directly serves a conference room as an extension of the activities of the conference room. Included in this category are such rooms as kitchenettes, chair storage rooms, projection rooms, and sound equipment rooms.
Construction Area	That portion of the gross area which cannot be put to assignable use because of the presence of structural features of the building.
Contract Board Students	Students who, by contract, agree to pay a specified charge for the provision of a certain number of meals during a specified period of time (usually a quarter, or semester).
Course	Organized subject matter (may be a discipline specialty) in which instruction is offered within a given period of time, (usually a quarter or semester) and for which credit toward graduation or certification is usually given.
Course Assignments	A series of elements identifying sections of courses taught: includes term and year, academic specialty, course number, and section.
Course Enrollment	One student enrolled in one course. Sometimes referred to as course registration.
Course Level	See Level of Course
Credit Hour	The numerical credit value that is awarded for completing a course, usually described in semester, term, or quarter hours, related to progress through the institution.

GLOSSARY (continued)

TERM	DESCRIPTION
Current List of Course Offerings	See Schedule of Courses
Custodial Area	The sum of all areas on all floors of a building used for building protection, care, maintenance, and operation.
Data Processing - Computer Facilities	A room (or group of rooms) for institution - wide processing of data by machines or computers. This category includes keypunch rooms, electronic data processing rooms, electronic computer rooms, and similar data processing areas.
Data Processing - Computer Facilities Service	A room which directly serves a Data Processing - Computer Facility as an extension of the activities of that facility. This category includes such rooms as card storage, paper form storage, tape storage, tape storage vaults, control rooms, plugboard storage, wiring rooms, equipment repair rooms, observation rooms, and similar service areas.
Degree of Exclusive Use	The extent to which an office is to be used by or assigned to an individual. Typically, offices are occupied on a single, double, or multiple use basis. For the purpose of these manuals, this is an institutionally defined variable.
Demonstration Facilities	A room (or group of rooms) used to practice the principles of certain subject - matter areas, particularly teaching and home management. This category includes demonstration schools, laboratory schools, pre-school nurseries, etc., If the facilities support the training of the college-level students involved as (certified) teachers. This category includes home management houses which serve to train college-level students in home management.
Demonstration Facilities Service	A room which directly serves a Demonstration Facility as an extension of the activities of the Demonstration Facility.

GLOSSARY (continued)

TERM	DESCRIPTION
Demonstration Facilities Service (continued)	Included in this category are facilities generally referred to as store rooms, laundry, etc. (in a home demonstration facility) and kitchen, lockers, and shower rooms (in a laboratory school).
Dental Clinic	A room used for the dental examination and/or treatment of humans. This category includes rooms generally referred to as dental clinics.
Dental Clinic Service	A room which serves a Dental Clinic as a direct extension of the activities in such a room. This category includes supporting laboratory services and other facilities which serve a Dental Clinic.
Design Development	The process by which the general requirements of a building, as expressed in the building program, are translated into a detailed set of plans.
Dormitory	Living quarters for unmarried persons. This category includes all bedrooms, non-public bathrooms, laundry rooms, pressing rooms, and storage rooms (other than Food Stores) in a residence hall for unmarried persons.
Equipment	Apparatus provided to fulfill a purpose of a program of Higher Education. Fixed equipment is that which is attached to the building. Moveable equipment is that which is not attached to the building.
Exhibition Facilities	A room used for exhibits. This category includes museums, art galleries, and similar exhibition areas. Study collections not primarily for general exhibition such as departmental displays of anthropological, botanical, or geological specimens should be classified under an appropriate Laboratory Facility category.

GLOSSARY (continued)

TERM	DESCRIPTION
Exhibition Facilities Service	A room which directly serves an Exhibition Facility as an extension of the activities. This category includes work rooms for the preparation of materials and displays, vault or other storage for works of art, and check rooms.
Existing Classroom Capacity	The number of weekly room-hours and weekly student-hours which existing classrooms can accommodate.
Existing Institution	An institution which has been in operation long enough to produce at least one graduating class.
Facilities Inventory	A tabulation of all physical facilities of the institution. When done in accordance with Federal guidelines, the facilities are classified by type of space, organizational unit, subject field, and function.
Facility	A building which is owned, leased, rented or used by the institution.
Faculty Contact Hour	One hour spent by one faculty member in contact with a scheduled section.
Faculty Load	The average teaching assignment per faculty member usually in terms of contact-hours or credit-hours which is sufficient to generate the need for one faculty member. For the purpose of these manuals, this is an institutionally defined variable.
Faculty Rank	See Academic Rank
Field-Service Facilities	A barn or similar structure for animal shelter or the handling, storage and/or protection of farm products, supplies, and tools. Field-Service Facilities include barns, animal shelters, sheds, silos, feed units, hay storage, and seedhouses. Greenhouses related to farm operations are included in this category. Structures are typically of light frame construction with unfinished interiors, usually related to agricultural field operations, and are frequently located outside the central campus area.

GLOSSARY (continued)

TERM	DESCRIPTION
Food Facilities	A room used for eating food. This category includes dining halls, cafeterias, snack bars, restaurants, and similar eating areas.
Food Facilities Service	A room which directly serves a Food Facility as an extension of the activities in such a facility. This category includes such areas as kitchens, refrigeration rooms, freezers, dishwashing rooms, cafeteria serving areas, and other non-dining areas.
Food Service in Residence Halls	Those facilities where food is prepared and served to the occupants. This category includes all dining halls, kitchens, and food service facilities in residence halls for unmarried persons.
Full Time	The institution's own concept of what type of load constitutes a full time load for students or for staff. Usually defined in terms of credit hours or percentage of appointment. For the purpose of these manuals, this is an institutionally defined variable.
Full Time Equivalent	The equivalent of one person who is deemed to be carrying a full load or having a full time appointment. For the purpose of these manuals, this is an institutionally defined variable.
Full Time Equivalent Faculty	Refers to full time in the individuals' capacity as academic staff. Usually includes only those with academic rank. For the purpose of these manuals, this is an institutionally defined variable.
Full Time Equivalent Staff	The number of employees equated to a full-time basis. (e.g. 2 half-time or 4 quarter-time equal one FTE employee). For the purpose of these manuals, this is an institutionally defined variable.
Full Time Equivalent Student	Represents one student carrying what the institution considers to be a full, normal academic load. Usually, this varies by level of student. For the purpose of these manuals, this is an institutionally defined variable.

TERM	DESCRIPTION
Full Time Equivalent Teaching Faculty	Full time equivalent persons engaged in instructing formally scheduled courses. For the purpose of these manuals, this is an institutionally defined variable.
Function	The use to which a type of room is put, generally in terms of instruction, research, public service, academic support, student service, institutional support, or independent operations.
General Planning Criteria	Space factors and standards which are useful for planning for aggregate space needs.
Gross Area	Sum of the floor areas included within the outside faces of exterior walls for all stories or areas, which have floor surfaces.
HEGIS	Higher Education General Information Survey The annual survey of college and university statistical data conducted by the National Center for Educational Statistics in the United States Office of Education.
Headcount Student	The number of individuals considered by the institution to be persons who are students. Includes both part-time and full-time individuals.
Headcount Enrollment	The number of specific individuals enrolled in courses recorded in the current list of course offerings during a given term or school year.
Headcount Faculty	The number of individual persons who are considered by the institution to be members of the faculty. Includes both part-time and full-time individuals.
Health Facility (Student)	A room for the medical examination or treatment of students. This cateogry includes examination rooms, bedrooms, surgery rooms and clinics.
Health Facilities Service (Student)	A room which directly serves a Health Facility (Student) as an extension of the activities in such a facility. Included in this category are such rooms as dispensaries, record rooms, waiting rooms, clinical laboratories, scrub-up rooms, and linen closets.

GLOSSARY (continued)

TERM	DESCRIPTION
Human Hospital Clinic Facilities	A room used for medical examination and/or treatment of humans as inpatients or outpatients. This category includes rooms generally referred to as examination rooms, operating rooms, x-ray rooms, physical therapy rooms, delivery rooms, labor rooms, recovery rooms, and similar facilities which are (or may be) used in the examination and/or treatment of several patients within the course of the day. It also includes such clinics as medical, surgical, obstetric-gynecology, pediatric, psychiatric, and ophthalmology. Physical and occupational therapy clinics associated with a hospital are also included.
Human Hospital - Clinic Facilities Service	A room which serves a Human Hospital - Clinic Facility as a direct extension of the activities in such a room. This category includes rooms generally referred to as clinical laboratories, pharmacy, radium storage, control rooms, isotope vaults, animal rooms supporting diagnostic functions, and similar rooms which support clinical facilities, but which the patient does not normally enter.
Human Hospital - Patient Care Facilities	A room which provides a bed for patients in a hospital. This category includes rooms generally referred to as bedrooms, wards, nurseries, and similar rooms.
Human Hospital - Patient Care Facilities Service	A room which serves a Patient Care Facility as a direct extension of the activities in such a room. This category includes rooms generally referred to as nurses stations, charting rooms, tub rooms, medication rooms, nourishment rooms, formula rooms, and food service facilities for patients.
Inactive Space	All rooms that are not used or occupied at the time of a facilities inventory because of new construction, major alteration, or condemnation.

GLOSSARY (continued)

TERM	DESCRIPTION
Independent Operations Program	A support program in the WICHE Program Classification Structure. Those program elements which are independent of, or unrelated to, basic missions of the institution.
Individual Study Laboratory	A room especially equipped and/or designed for individual student experimentation, observation or practice in a particular field of study. Included in this category are music practice rooms, individual study laboratories, and similar rooms which serve a particular subject-matter area. Stations may be grouped (as in an individual study laboratory) or individualized (as in a music practice room).
Individual Study Laboratory Service	A room which directly serves an individual study laboratory as an extension of the activities of such a facility. Included in this category are rooms which serve Individual Study Laboratories.
Induced Course Load Matrix (ICLM)	A matrix which describes the distribution of the average load placed on the instruction program by students pursuing various academic degrees, (ICLM).
Institutional Support Program	A support program in the WICHE Program Classification Structure consisting of those activities within the institution which provide campus-wide support to other programs.
Instructional Load	See Faculty Load
Instruction Program	A primary program in the WICHE Program Classificatio Structure consisting of all formal instructional activities in which a student engages to earn credit toward a degree or certificate.
Level of Course	The level of sophistication at which instruction in an academic specialty may be offered or the level of student to which the course is directed primarily. For the purpose of these manuals, this is an institutionally defined variable. The WICHE Data Elements Dictionary: Course lists preparatory, lower division, upper division, upper division and graduate, graduate, and other as suggested course levels.

GLOSSARY (continued)

TERM	DESCRIPTION
Level of Student	Reflects a student's level of progress toward a degree. For the purpose of these manuals, this is an institutionally defined variable. The WICHE Data Elements Dictionary: Student lists 12 levels of students.
Library Processing Rooms	A room which serves a study room, stack or open-stack reading room as a supporting service to such rooms. Included in this category are rooms generally referred to as card catalog, circulation desk, bookbinding, microfilm processing, and audio-visual record-playback equipment for distribution to individual study stations.
Lounge Facilities	A room used for rest and relaxtion. A lounge is typically equipped with upholstered furniture, draperies, and/or carpeting.
Lounge Facilities Service	A room which directly serves a lounge, such as a kitchenette.
Major	A degree program in which the student is enrolled.
Major Degree Field	An academic specialty in which a degree is offered.
Master Plan	A comprehensive statement of an institution's plan for future development. Includes a statement of goals, objectives, and underlying assumptions as well as projections of enrollments, budgets, staffing requirements, and facilities needs.
Mechanical Area	That portion of the gross area designed to house mechanical equipment, utility services, and non-private toilet facilities.
Merchandising Facilities	A room (or group of rooms) used to sell products or services. This category includes such rooms as bookstores, barber shops, post offices, dairy stores, student union "desks," and motel-hotel rooms.

GLOSSARY (continued)

TERM	DESCRIPTION
Merchandising Facilities Service	A room which directly serves a Merchandising Facility as an extension of the activities in that room. Included in this category are rooms generally referred to as supply closets, sorting rooms, freezers, telephone rooms, linen rooms, laundry rooms, valet service, and private toilets.
Multiple Family Dwelling	A duplex house or apartment building for more than one family. This category includes student and faculty apartment buildings and duplex houses rented to staff and/or students.
Multi-shift Use	Extended use of a facility on a shift basis. More than one person utilizes the space but not at one time.
New Institution	An institution which has not yet produced a graduating class.
Non-Class Laboratory	A room used for laboratory applications, research, and/or training in research methodology which requires special purpose equipment for staff and/or student experimentation or observation. Included in this category are rooms generally referred to as research laboratories and research laboratory-offices.
Non-Class Laboratory Service	A room which directly serves a non-class laboratory as an extension of the activities of the non-class laboratory. Included in this category are balance rooms, cold rooms, stock rooms, dark rooms, animal rooms, greenhouses, etc., which serve a Non-Class Laboratory.
Number of Stations (N)	The station-count in a room.

GLOSSARY (continued)

TERM	DESCRIPTION
Office	A room used by faculty, student, or staff working at a desk (or table). Included in this category are rooms generally referred to as faculty offices, administrative offices, clerical offices, graduate assistant offices, teaching assistant offices, student offices, etc. Also included in this category is a Studio (music, art, etc.) if such a room serves as an office for a staff member. A Studio intended to serve a group of students is classified as Class Laboratory. An Office typically is equipped with one or more desks, chairs, tables, bookcases, and/or filing cabinets.
Office and Office-Related Space	Comprises all spaces which are related to offices such as offices, office service rooms, conference rooms, and conference service rooms.
Office Service	A room which directly serves an office (or group of offices) as an extension of the activities in an office (or group of offices.) Included in this category are file rooms, mimeograph rooms, vaults, waiting rooms, interview rooms, closets, private toilets, records rooms, and office supply rooms. Centralized mimeograph and printing shops which are campus-wide in scope should be classified as Shop Facilities.
Office Station	Generally consists of a desk and chair and other office-type equipment required to accommodate one institutional staff member.
One-Family Dwelling	A house provided for one family. This category includes houses provided for, or rented to, staff (or students).
Open-Stack Reading Room	A room which is a combination of study room and stack, generally without boundaries between the stack areas and the study areas. Included in this category are rooms generally referred to as open-stack reading rooms.

GLOSSARY (continued)

TERM	DESCRITPION
Organized Research Program	A primary program in the WICHE Program Classification Program consisting of those research-related program elements established within the institution under the terms of agreement with agencies external to the institution or separately budgeted and conducted with internal funds.
Other Weekly Student-Hours	Weekly student-hours of instruction in other than classroom and class laboratory courses. For example, physical education.
Part Time	Any student or staff member who falls below the institutionally set minimum for consideration as full time.
Personnel Inventory	A tabulation of all personnel at the institution. The Fair Labor Standards Act personnel categories are used frequently to define personnel.
Program Analysis	The investigation of the historical relationships between specified variables or phenomena (e.g., the relationship between weekly student-hours and weekly faculty contact-hours.
Program Data	Information concerning the programs of the institution. Usually concerned with numbers of students and staff, tabulated by various criteria which relate to planning requirements.
Program Planning	Study concerned with providing program data which relates to projection and planning for institutional needs.
Public Service Program	A primary program in the WICHE Program Classification Structure consisting of those program elements which produce outputs directed toward the benefit of the community or individuals residing within the geographic service area of the institution.
Recreation Facilities	A room which is used by students, staff, and/or the public for recreational purposes. This category includes such rooms as bowling alleys, pool and billiards rooms, ping pong rooms, ballrooms, chess rooms, card-playing rooms, (non-instructional) music listening rooms, and hobby rooms.

GLOSSARY (continued)

TERM	DESCRIPTION
Recreation Facilities Service	A room which directly serves a Recreation Facility as an extension of the activities of such a facility. This category includes storage closets, equipment issue rooms, cashiers desk, and similar areas.
Researcher	A person formally engaged in research at the institution. For the purpose of these manuals, this is an institutionally defined variable.
Research Station	Comprises the total laboratory-type facilities necessary to accommodate one research worker. For the purpose of these manuals, this is an institutionally defined variable.
Residence for Single Persons	A residence designed for unmarried persons. This category includes all bedrooms, non-public bathrooms, dining halls, kitchens, laundry rooms, pressing rooms, and storage rooms in a residence for unmarried persons.
Room Type	See Type of Room
Room-Utilization Rate (RUR)	The number of hours per week a room is used
Room-Utilization Standard	A numerical value, usually set by institutions and/or organizations, which specifies the expected Room-Utilization Rate.
Schedule of Courses	A publication containing information on the courses to be offered for a given term, including days, hours, place of meeting, and credit designation.
Section	One or more students formally organized for instruction in a specific course under the supervision of an instructor. (A student or group of students who may meet informally or irregularly for discussion with an instructor would not be considered a "section").

GLOSSARY (continued)

TERM	DESCRIPTION
Section Size	The number of enrollments in a section, usually differentiated by type of instruction (classroom, class laboratory).
Shop Facilities	A room used for the manufacture or maintenance of products and equipment. This category includes such rooms as carpenter shops, plumbing shops, electrical shops, painting shops, and similar physical plant maintenance facilities. It also includes central printing and duplicating shops, central receiving and central stores.
Shop Facilities Service	A room which directly serves a Shop as an extension of the activities of such a room. Included in this category are tool supply-storage rooms, materials storage rooms, and similar equipment or material supply and/or storage rooms. Locker rooms, shower rooms, lunch rooms, and similar non-public areas should be included.
Site Planning	The process by which projected facilities requirements are translated into a proposed future campus "map". Includes such considerations as building site location, pedestrian and vehicular circulation, utilities distribution and land use determination.
Space Factor	See General Planning Criteria.
Space Management	The allocation of an institution's facilities resources to the various organizational units, usually through application of detailed planning and programming methodologies.

GLOSSARY (continued)

TERM	DESCRIPTION
Special Class Laboratory	A room used by informally (irregularly) scheduled classes which require special-purpose equipment for student participation, experimentation, observation or practice in a field-of-study. A Special Class Laboratory is designed and/or furnished with specialized equipment to serve the needs of a particular area of study for group instruction in informally (or irregularly) scheduled classes. The design and/or equipment in such a room normally precludes its use for other areas of study. Special Class Laboratories typically (but not necessarily or exclusively) include such rooms as language laboratories, (group) music practice rooms, and (group) studios.
Special Class Laboratory Service	A room which directly serves a special class laboratory as an extension of the activities in such a facility. Included in this category are rooms which serve Special Class Laboratories.
Stack	A room (or portion of a room) used to provide shelving for books or audio-visual materials used by staff and/or students on an individual basis. Included in this category are rooms generally referred to as library stacks.
Station	The total facilities necessary to accommodate one person. For the purpose of these manuals, this is an institutionally defined variable.
Station-Count (N/R)	The number of stations in a room.
Station-Occupancy Ratio (SOR)	The ratio of Station-Utilization Rate (SUR) to Room-Utilization Rate (RUR) which is the proportion of stations used when room is scheduled:

$$\text{Station-Occupancy Ratio} = \frac{\text{Station-Utilization Rate}}{\text{Room-Utilization Rate}}$$

$$\text{SOR} = \frac{\text{WSH per Station}}{\text{WRH per Room}}$$

$$\text{SOR} = \frac{\text{SUR}}{\text{RUR}}$$

GLOSSARY (continued)

TERM	DESCRIPTION
Station-Utilization Rate (SUR)	The average number of hours per week each station is used: $\text{Station-Utilization Rate} = \dfrac{\text{Total Weekly Student-Hours}}{\text{Total Number of Stations}}$ $\text{SUR} = \text{Average WSH per Station}$
Storage Facilities	A room used to store materials. Classification of a room as a Storage Facility is limited by definition to a central storage facility (warehouse) and inactive departmental storage. Storage related to other types of space follow the classification of that type of space with a "service" designation. The distinction between "service" and "storage" rests on the possibility of physical separation of the materials stored. If the material being stored could be placed in a warehouse, implying only occasional demand for the materials, then Storage Facility is the appropriate classification. Storage which must, by the nature of the materials stored and the demands placed upon them by the program, be close at hand should be classified according to the appropriate "Service" category.
Storage Facilities Service	A room which directly serves a Storage Facility.
Student Level	See level of student.
Student Service Program	A support program in the WICHE Program Classification Structure consisting of those program elements to related to the institution's student body, excluding the degree related curriculum and student records.
Study Facilities Service	A room which directly serves as a study room, stack, open-stack reading room as library processing room as a direct extension of the activities in such rooms. Because such facilities are minimal in library-type spaces this one category of Study Facilities Service is provided for all types of STUDY FACILITIES. Included are such areas as closets, locker space, and coatrooms.

GLOSSARY (continued)

TERM	DESCRIPTION
Study Room	A room used to study books or audio-visual materials on an individual basis. Included in this category are rooms generally referred to as library reading rooms, carrels, study rooms, individual study stations, study booths, and similar rooms which are intended for general study purposes. Study stations may be grouped (as in a library reading room) or individualized (as in a carrel). Study stations in a Study Room may include typewriters, remote terminals of a computer, and electronic display equipment.
Turnovers	The number of times each dining station can be used during the serving of a single meal. The result of dividing the total time for serving a meal by the average length of time required by an average student to eat that meal comfortably.
Type of Room	HEGIS facilities inventory category designation which classifies all types of space found in buildings on the campus of an institution of higher education by its physical characteristics in relation to its primary use.
Unit Floor Area	Assignable square feet of floor space necessary to accommodate one person performing a special operation, a particular piece of equipment, or a specified activity (handball).
Vehicle Storage	A room (or structure) which is used to store vehicles. This category includes rooms (or structures) generally referred to as garages, boat houses, airport hangars, and other storage areas for vehicles (broadly defined).
Vehicle Storage Service	A room (or structure) used to service vehicles. This category includes any area associated with a Vehicle Storage facility which is used for the maintenance and repair of automotive equipment, boats, airplanes, and similar vehicles.

GLOSSARY (continued)

TERM	DESCRIPTION
Veterinary Hospital Clinic Facilities	A room used for the medical examination and/or treatment of animals as inpatients or outpatients. This category includes rooms generally referred to as examination rooms, surgery rooms, x-ray rooms, and similar facilities which are (or may be) used in the examination and/or treatment of several patients within the course of a day.
Veterinary Hospital - Clinic Facilities Service	A room which serves a Clinic Facility as a direct extension of the activities in such a facility. This category includes rooms generally referred to as clinical laboratories, pharmacy, radium storage, scrub-up rooms, and animal rooms used for diagnostic purposes.
Veterinary Hospital - Animal Care Facilities	A room which provides a cage or stall for animal patients. This category includes rooms generally referred to as animal rooms, stalls, wards, and similar rooms.
Veterinary Hospital - Animal Care Facilities Service	A room which serves an Animal Care Facility as a direct extension of the activities in such a room. This category includes room generally referred to as feed storage rooms, feed mixing rooms, cage washing rooms, and similar facilities.
Volume Equivalents	An agreed upon convention for converting such library materials as pamphlets, microforms, and recordings to a standard unit of shelf storage.
Weekly Faculty Contact Hours	Number of faculty contact hours in one week.
Weekly Room-Hour	The time that a room is used on a weekly basis for scheduled activities required for the courses in the schedule of courses.

GLOSSARY (conclusion)

TERM	DESCRIPTION
Weekly Room-Hours Capacity (WRH_c)	The product of the Number of Rooms (R) and the Room-Utilization Rate (RUR). (Note: This is an optimum measure.) $WRH_c = (R) \times (RUR)$
Weekly Student-Hours	Unit of Measure which represents one hour of instruction given to one student in one week.
Weekly Student Hour Hour Capacity (WSH_c)	The product of the Number of Stations (N) and the Station-Utilization Rate (SUR). (Note: This is an optimum measure.) $WSH_c = (N) \times (SUR)$
Weekly Student Hours of Classroom Instruction	The number of hours per week, per student, that the course meets for instruction in classrooms (lecture, recitation/discussion, seminar).
Weekly Student Hours of Laboratory Instruction	The number of hours per week, per student, that the course meets in class laboratories.

INDEX

An INDEX, which will link the terms, techniques, and specific sections with page locations in the manuals, will be included in the final version of the document. Because of the possibility of extensive revisions to the manual as a result of the field review, it was felt that efforts devoted to the complex task of constructing a complete and reliable INDEX should not be done twice. Moreover, different pagination methods in the Field Review Version and in the final SAM document render any current indexing efforts virtually useless.

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INTRODUCTION TO MANUAL TWO

CLASSROOM AND CLASS LABORATORY FACILITIES

Manual Two of the Space Analysis Manuals includes facilities evaluation and projection procedures for several types of space which are used in conjunction with scheduled instructional activities:

1. Classroom Facilities
2. Class Laboratory Facilities
3. Special Class Laboratory Facilities
4. Individual Study Laboratory Facilities

During the last ten to fifteen years no other collegiate facilities have been studied more intensively than classrooms and class laboratories. This has been true whether such rooms represent less than 10 percent of the space as they typically do in large universities or 50 percent of the space as they typically do in many community colleges. These studies were given impetus by Russell and Doi's Manual for Studies of Space Utilization in Colleges and Universities and by intra- and extra-institutional pressures to make better use of existing physical resources.

The present state of the art in classroom and class laboratory utilization has been limited usually to the computation of average levels of utilization. The only recognition of the need for differential criteria has been limited to the average number of assignable square feet required by class laboratories in various academic areas. (Some systems have made further allowances for lower and upper division class laboratories.)

Although average values can be useful in developing quick rule-of-thumb approximations, there is no need to use them in a careful evaluation of the capacity of existing rooms nor in a comprehensive projection of required facilities. Indeed there are cogent and compelling reasons why averages should not be used. For example, large lecture rooms may be needed because the instructional techniques require them; further, their use may bring certain economies in operating expenses. Either of these two program considerations may be sufficient to justify a lecture room even though its potential utilization is minimal. Indeed, in the total evaluation of all resource allocations, enhancing the utilization of such a facility may be of relatively minor importance. Therefore, in the development of evaluation and projection techniques for classrooms and class laboratories it is proposed that differential utilization criteria be used. Station count (number of stations in the room) is proposed as the basis for these criteria in the case of classrooms, academic specialty in the case of class laboratories.

This manual discusses three techniques for the evaluation and projection of physical facility requirements for classrooms and class laboratories. One is a detailed method designed to provide information on a specific room-by-room basis. The other two are more generalized planning methods intended to serve as rough rule-of-thumb estimates of classroom and class laboratory requirements.

Each of these three techniques is discussed under three conditions:

- The evaluation of existing facilities
- The projection of requirements for a new institution
- The projection of requirements for an existing institution

Each of these techniques requires certain utilization assumptions. The evaluation technique and the projection of requirements for an existing institution require inventory data on existing classroom and class laboratory facilities. The two projective techniques require program data yielding numbers of weekly room-hours and weekly student-hours; for the detailed method these data must be available by size of section in the case of classrooms and by academic specialty in the case of class laboratories.

More specifically, the detailed projection procedures discussed here assume that student enrollments have been projected to specific courses, that the section-size limitations of those courses are known, and that the facility implications of the course (number of hours per week of lecture, recitation, class laboratory, etc.) have been specified.

Two utilization assumptions are required in the detailed planning methods and one in the generalized planning methods. These are a room utilization rate and a station occupancy ratio. These two utilization criteria and their relationship to other utilization measures are defined below.

Room-utilization rate (RUR) is the average number of hours per week a group of rooms is scheduled for use:

$$\text{Room-Utilization Rate} = \frac{(\text{Scheduled Weekly Room-Hours})}{(\text{Number of Rooms})}$$

$$\text{RUR} = \text{Average WRH per Room}$$

Note that a room-utilization rate may be applied to all classrooms (or class laboratories) in an institution or to sub-groups of classrooms (or class laboratories)--for example, all classrooms with a particular number of stations per room (station count) or all class laboratories in a particular academic specialty.

Station-occupancy ratio (SOR) is the proportion of stations scheduled for use when the room is scheduled for use:

$$\text{Station-Occupancy Ratio} = \frac{\text{(Scheduled Weekly Student-Hours/Station)}}{\text{(Scheduled Weekly Room-Hours/Room)}}$$

$$\text{SOR} = \frac{\text{(Scheduled WSH/N)}}{\text{(Scheduled WSH/R)}}$$

Note that a station-occupancy ratio also may be applied to all classrooms (or class laboratories) in an institution or to sub-groups thereof.

Station-occupancy ratio (SOR) may also be defined as the ratio of average section (class) size to average station count (number of stations per room):

$$\text{Station-Occupancy Ratio} = \frac{\text{Average Section Size}}{\text{Average Station Count}}$$

in which:

$$\text{Average Section Size} = \frac{\text{(Scheduled Weekly Student-Hours)}}{\text{Scheduled Weekly Room-Hours)}}$$

$$\overline{\text{SS}} = \text{Average Students per Room}$$

and:

$$\text{Average Station-Count} = \frac{\text{(Number of Stations)}}{\text{(Number of Rooms)}}$$

$$\overline{\text{N/R}} = \text{Average Stations per Room}$$

Station-utilization rate (SUR) is the average number of hours per week the total number of stations in a group of rooms is scheduled for use:

$$\text{Station-Utilization Rate} = \frac{\text{(Scheduled Weekly Student-Hours)}}{\text{(Number of Stations)}}$$

$$\text{SUR} = \text{Average WSH per Station}$$

Station-utilization rate (SUR) may also be expressed as the mathematical product of the room-utilization rate and the station-occupancy ratio:

$$\text{SUR} = (\text{WRH}) \times (\text{SOR})$$

Note that a station-utilization rate may be applied to all classrooms (or class laboratories) in an institution or to sub-groups thereof.

It is important to recognize that only formally scheduled hours of instruction are directly involved in the utilization assumptions required by the procedures discussed in this manual. The numerical values which are assumed for room utilization rates and station occupancy ratios represent only the formally scheduled hours of instruction. It is important in setting these assumed utilization rates that sufficient allowance be made for the non-scheduled and informal use of classroom and class laboratory facilities.

In addition to the utilization criteria defined above, certain other terminology is used in this manual with a specialized meaning. Although all terms are defined in the Glossary in Section 5.0 of Manual One, it is important to understand the way in which two terms are used in the development of the techniques which follow. First, the word "section" is used where "class" can mean either a scheduled meeting of a course, a group of students assembled for instruction, or a group of students whose graduation date is the same--freshman, sophomore, etc., the word "section" is used to designate a group of students assembled in a regularly scheduled meeting of a course. Second, "station count" is used as a shorthand designation of the longer term "number of stations in the room."

The exposition which follows is limited to procedures and techniques for the evaluation and projection of classroom and class laboratory requirements. The results of the application of these procedures will be only as good as the validity of the program data, the adequacy of the utilization assumptions, and the reliability of the inventory data.

CLASSROOM

ROOM TYPES INCLUDED:

General-purpose classrooms, recitation rooms, lecture rooms, seminar rooms, and related service rooms.

DISCUSSION:

Because a classroom can be used by more than one department, it is considered to be an institution-wide resource.

Because a classroom can serve more than one group of students, it usually is scheduled on a formal basis.

The conjunciton of these two conditions is unique to classrooms. Some facilities, such as library study spaces, serve more than one group of students, but they are not scheduled. Other facilities, such as class laboratories, are scheduled, but they are not an institution-wide resource.
Three methods of evaluating or projecting classroom requirements are discussed here:

- a detailed method designed to evaluate or project the:
    - number of classrooms,
    - number of stations (station-count) in each classroom,
    - assignable square feet in each classroom and classroom service facilities,
    - assignable square feet of classroom service facilities;
- a general planning method designed to evaluate or project
    - total number of classrooms,
    - total stations, and
    - total assignable square feet including classroom service facilities;
- a general planning method designed to evaluate or project only total assignable square feet of classroom facilities.

The applications of each of these three methods are illustrated under three conditions:

- evaluation of existing classroom capacities
- projection of future classroom requirements for
    - a new institution
    - an existing institution.

INTRODUCTORY COMMENTS

DETAILED METHOD

The detailed method described and illustrated on the following pages represents a procedure recommended for use when the evaluation and projection of classroom requirements must be determined as explicitly as possible.

Very detailed data are assumed. In some instances, institutions may need to modify the procedure because data of the required level of detail are not available. The procedure is designed to permit such modifications. However, it must be recognized that the validity of the results may be affected when less specific data are used.

Both the evaluation and the projection of classroom facilities require two utilization assumptions: a room-utilization rate and a station-occupancy ratio. It is a fundamental thesis of this procedure that utilization criteria specific to each classroom (or at least specific to classrooms having the same station-count) should be used rather than averages applied to all classrooms. In most institutions there is ample justification for less intensive scheduled use of a large lecture room than of the typical classroom. In general, this is true for both the room-utilization rate and the station-occupancy ratio. At the other end of the scale institutions may vary considerably; some may expect low room utilization rates; others may find the highest rates possible in the smallest rooms. That is not likely to be true of the station-occupancy ratio, however. That ratio is most likely to reach its maximum value for rooms where station count (the number of stations in the room) most nearly correspond to the average section size. In most instances, the station-occupancy ratio can be expected to decrease as the station count becomes relatively larger or smaller than the average section size.

In addition to these utilization assumptions, the evaluation of existing classroom capacity requires a detailed inventory of existing classroom facilities. On the basis of the utilization assumptions and inventory data of existing classroom facilities, it yields estimates of the number of weekly room-hours and weekly student-hours which existing classrooms of each station count can accommodate. It should be noted that this procedure differs from the typical classroom-utilization study. It is designed to answer not how well (or poorly) existing classrooms are being used but rather what the capacity of existing classrooms is to accommodate an educational program.

In addition to the utilization assumptions described above, the projection of classroom requirements for a new institution requires detailed distributions of weekly room-hours and weekly student-hours by size of section. (The methodology for determining these data is discussed in Manual Six.) From these program data and utilization assumptions it is possible to project the required number of classrooms of each station count. That result, combined with an evaluation of the type of classroom seating and consequent assignable square feet per station, permits the specific designation of the classroom requirements which results from a proposed academic program.

The projection of classroom requirements for an existing institution is similar to that of a new institution. However, it requires, in addition, data concerning existing classroom facilities. The procedure results in the specification of the required number of additional classrooms of each station count and the assignable square feet in each.

DISCUSSION

DETAILED METHOD

EVALUATION OF EXISTING CLASSROOM CAPACITY

DATA TO BE DETERMINED:

The number of:

- weekly room-hours (WRH), and
- weekly student-hours (WSH)

which existing classrooms of each station count can accommodate.

PROGRAM DATA REQUIRED:

None. (For a discussion of the application of current program data to the utilization of classrooms see Manual Six).

FACILITIES DATA REQUIRED:

A distribution of:

- the number of existing classrooms (R)

and for each classroom

- the number of stations (station-count = N/R) and
- the assignable square feet (ASF)

and for classroom service facilities

- the assignable square feet (ASF).

ADDITIONAL FACILITIES DATA:

If the evaluation includes an assessment of the capability of existing classrooms to accommodate additional stations (or the desirability of reducing the station-count) then these data may be helpful.

- information on type of furniture,
- floor plans for each room, and/or
- schematic drawings of typical furniture arrangements, either drawn to scale or showing essential dimensions.

UTILIZATION ASSUMPTIONS REQUIRED:

For each classroom:

- a room-utilization rate (RUR) and
- a station-occupancy ratio (SOR).

PROCEDURE:

1. Obtain from the facilities inventory:

   - the number of existing classrooms (R)

   and for each existing classroom

   - the number of stations (station-count = N/R)
   - the assignable square feet (ASF)

   and for classroom service facilities

   - the assignable square feet (ASF).

   These data are illustrated on Table 2.1.

2. Establish as a matter of institutional policy:

   - a room-utilization rate (RUR) and
   - a station-occupancy ratio (SOR).

   The utilization criteria may be average values applied to all rooms and stations, or specific values applied to each room and/or to each station-count. The use of specific values is illustrated on Table 2.2.

3. Determine the number of weekly room-hours which can be accommodated in existing classrooms (WRH_c).

   This weekly room-hour capacity (WRH_c) is the mathematical product of the number of rooms (R) of each station-count and the room-utilization rate (RUR) for each station-count:

$$\text{Weekly Room-Hour Capacity} = (\text{Number of Rooms}) \times (\text{Room-Utilization Rate})$$

$$WRH_c = (R) \times (RUR)$$

For example, if it is assumed that each classroom with 55 stations can be used 30 hours per week (room-utilization rate) and if there are 3 rooms with 55 stations, then

$$\begin{aligned} WRH_c &= (3) \times (30) \\ &= 90 \text{ weekly room-hours} \end{aligned}$$

4. Determine the number of weekly student-hours (WSH) which can be accommodated in existing classrooms.

   This weekly student-hour capacity (WSH_c) is the mathematical product of the number of stations (N) and the station-utilization rate (SUR), for each station count:

   $$\text{Weekly Student-Hour Capacity} = \begin{aligned}&(\text{Number of Stations}) \times \\ &(\text{Station-Utilization Rate})\end{aligned}$$

   $$WSH_c = (N) \times (SUR)^*$$

   For example, if it is assumed that 3 classrooms, each with 55 stations, can be used 30 hours per week (room-utilization rate) and that .60 of the seats will be occupied when the room is used (station-occupancy ratio), then

   $$\begin{aligned} WSH_c &= (3 \times 55) \times (30 \times .60)^* \\ &= (165) \times (18) \\ &= 2{,}970 \text{ weekly student-hours} \end{aligned}$$

   $^*SUR = (RUR) \times (SOR)$

COMMENTS ON THE PROCEDURE:

The procedure outlined above makes no assumption about the quality of the classroom space. If some existing classroom space is of such poor quality that it will no longer be used, then that adjustment should be reflected in Step 1 of the PROCEDURE; that is, the number of rooms, number of stations, and the assignable square feet of classroom and classroom service space should be reduced by the corresponding numbers and amounts which will no longer be used. Note that the procedure does allow for the limited use of certain rooms by permitting specific room and/or station utilization rates to be applied to specific classrooms.

EXAMPLE

DETAILED METHOD

EVALUATION OF EXISTING CLASSROOM CAPACITY

DATA TO BE DETERMINED:

The number of:

- weekly room-hours (WRH), and
- weekly student-hours (WSH)

which existing classrooms of each station-count (N/R) can accommodate.

PROCEDURE:

1. Obtain from the facilities inventory:
   - the number of existing classrooms (R)

   and for each existing classroom
   - the number of stations (station count = N/R)
   - the assignable square feet (ASF)

   and for classroom service facilities
   - the assignable square feet (ASF).

TABLE 2.1
EXISTING CLASSROOMS BY STATION COUNT AND ASSIGNABLE SQUARE FEET

STATION COUNT*	NUMBER OF ROOMS	ASSIGNABLE SQUARE FEET, EACH ROOM	TOTAL STATIONS	TOTAL ASSIGNABLE SQUARE FEET
N/R*	R	ASF/R	N	ASF
200	1	2,000	200	2,000
100	1	1,200	100	1,200
75	1	1,050	75	1,050
55	3	770	165	2,310
35	4	560	140	2,240
35	6	700	210	4,200
20	17	500	340	8,500
10	7	250	70	1,750
Subtotals	40	-------	1,300	23,250
Projection Room	1	150	------	150
TOTAL	--	-------	------	23,400

*Number of stations per room.

2. Establish for each station-count:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

TABLE 2.2

ASSUMED ROOM-UTILIZATION RATES, STATION-OCCUPANCY RATIOS, AND STATION-UTILIZATION RATES FOR VARIOUS STATION-COUNTS

STATION-COUNT	ASSUMED ROOM-UTILIZATION RATE	ASSUMED STATION-OCCUPANCY RATIO	ASSUMED STATION-UTILIZATION RATE
N/R	RUR	SOR	SUR*
201 and above	20	.45	9.0
151 - 200	22	.50	11.0
101 - 150	22	.50	11.0
91 - 100	26	.55	14.3
81 - 90	26	.55	14.3
76 - 80	26	.55	14.3
71 - 75	28	.60	16.8
66 - 70	28	.60	16.8
61 - 65	28	.60	16.8
56 - 60	28	.60	16.8
51 - 55	30	.60	18.0
46 - 50	30	.60	18.0
41 - 45	30	.60	18.0
36 - 40	30	.60	18.0
31 - 35	30	.70	21.0
26 - 30	30	.70	21.0
21 - 25	30	.75	22.5
16 - 20	30	.83	25.0
11 - 15	32	.65	20.8
1 - 10	32	.60	19.2

*SUR = (RUR) x (SOR)

Note: The utilization rates displayed in Table 2.2 are illustrative only and are not recommended as standards.

3. Determine the number of weekly room-hours which can be accommodated in existing classrooms (WRH_c).

TABLE 2.3

WEEKLY ROOM-HOUR CAPACITY OF CLASSROOMS FOR EACH STATION-COUNT

STATION COUNT	NUMBER OF ROOMS	ROOM UTILIZATION RATE	WEEKLY ROOM-HOUR CAPACITY
N/R	R	RUR	WRH_c = R x RUR
200	1	22	22
100	1	26	26
75	1	28	28
55	3	30	90
35	10	30	300
20	17	30	510
10	7	32	224
TOTALS --	40	--	1,200

Average Room-Utilization Rate = (Total WRH_c) / (Total Rooms)

= (1200) / (40)

= 30 Weekly Room-Hours per room

Note that the same RUR need not be applied to all rooms and given station-counts. For example, if two of the rooms of 35 stations were located in a remote part of the campus and the room could be scheduled for use only 20 hours per week, that condition could be reflected in Table 2.3.

4. Determine the number of weekly student-hours which can be accommodated in existing classrooms (WSH_c).

TABLE 2.4

WEEKLY STUDENT-HOUR CAPACITY (WSH_c)
OF CLASSROOMS FOR EACH STATION-COUNT

STATION-COUNT	NUMBER OF ROOMS	TOTAL STATIONS	ASSUMED STATION-UTILIZATION RATE	WEEKLY STUDENT-HOUR CAPACITY
N/R	R	N	SUR	WSH_c = N x SUR
200	1	200	11.0	2200
100	1	100	14.3	1430
75	1	75	16.8	1260
55	3	165	18.0	2970
35	4	140	21.0	2940
35	6	210	21.0	4410
20	17	340	25.0	8500
10	7	70	19.2	1344
TOTALS	40	1,300	----	25,054

Average Station-Utilization Rate = (WSH_c) / (N)

= (25,054) / (1300)

= 19.3 weekly student-hours per station

Average Station-Occupancy Ratio = [(WSH_c)/(N)]/(RUR)

= (19.3)/(30)

= .64

Note that this example makes no allowance for classroom facilities of such poor quality that they should be abandoned. Where such an adjustment is necessary it should be reflected in the existing facilities data of Steps 1, 3, and 4.

DISCUSSION
DETAILED METHOD
PROJECTION OF CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

Distribution of

- the number of classrooms required (R),

indicating for each classroom

- the number of stations (station-count = N/R),
- the assignable square feet (ASF)

and for classroom service facilities

- the assignable square feet (ASF).

PROGRAM DATA REQUIRED:

- a distribution of projected classroom weekly room-hours (WRH) by size of section (SS),

which implies:

- a distribution of projected classroom weekly student-hours (WSH) by size of section (SS).

These distributions are derived from:

- projected course enrollments

distributed by:

- size of classroom section, and
- number of classroom hours of instruction required per section.

FACILITIES DATA REQUIRED:

None

UTILIZATION ASSUMPTIONS REQUIRED:

For each projected classroom:

- a room-utilization rate (RUR),
- a station-occupancy ratio (SOR), and
- the number of assignable square feet per station (ASF/N).

PROCEDURE:

1. Obtain from the program analysis procedure (discussed in Manual Six) these distributions:

   - weekly room-hours (WRH) by size of section (SS), and
   - weekly student-hours (WSH) by size of section (SS).

   These data are illustrated on Table 2.5.

2. Establish for each station-count, as a matter of institutional policy:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

   These utilization criteria may be average values applied to all rooms and stations, or specific values applied to each room and/or to each station count. The use of specific values is illustrated on Table 2.6.

3. Determine:

   - tentative station-count criteria, and
   - tentative station-counts

   by application of

   - the room-utilization rate (RUR)

   to the

   - distribution of weekly room-hours (WRH) by size of section (SS).

   Inspection of the distribution of projected weekly room-hours (WRH) by size of section (SS) provides the basis for determining a tentative station-count distribution. For example, the largest room must be at least equal in number of stations (station-count) to the largest projected section size. It may be assumed that smaller sections will be scheduled in that room up to the level of its room-utilization rate. For academic and/or other reasons some of the smaller sections may not be appropriate to the largest room. In this case, the station-count of the next-to-the-largest room may be placed at a higher value than actually is required by the distribution of weekly room-hours by size of section.

Other restrictions may be placed on the distribution of station counts. For example, it may be assumed that room station-counts will be in multiples of 10 (or 5, or any set of numbers).

After the distribution of tentative station-counts is determined, the number of rooms for each tentative station-count is calculated. This is accomplished by the successive accumulation of weekly room-hours up to the level of the room-utilization rate set for a room of that capacity. After that room has been "used" to its full rate, then another room is assumed. When the accumulation of weekly room-hours for that room meets the full utilization rate for that room, another room is assumed to be needed. The process continues until all weekly room-hours are accommodated in rooms appropriate to the section size at which the weekly room-hours occur. The final result is a distribution of number of rooms required for each tentatively assumed station-count.

4. Adjust the tentatively assumed station-count (N/R) by use of the station-utilization rate (SUR).

   The distribution of rooms by station-count which resulted from the calculations in Step 3 assumes that absolute scheduling flexibility is possible. Because such flexibility is not possible, it is necessary to adjust the tentative station-counts to the assumed station-utilization rate (SUR).

   The adjustment is accomplished by dividing the number of projected weekly student-hours (WSH) at each assumed station-count by the assumed station-utilization rate (SUR). The result is converted to a station-count per room by dividing by the number of rooms.

5. Assign a final station-count per room (N/R) and check the weekly student-hour capacity (WSH_c) of the proposed distribution.

   The calculated station-count per room (N/R) in Step 4 yields uneven, non-modular numbers. These are modified generally to create a set of modular numbers appropriate to classroom-design considerations.

Because the station-utilization rate (SUR) in Step 4 was applied to tentatively assumed station-counts, it must now be applied to the finally assigned station-counts. Multiplication of the appropriate station-utilization rate by the total number of stations for each station-count provides the number of weekly student-hours each room size will accommodate. The total WSH should be approximately equal to the projected WSH and the subtotals for each station-count should be approximately equal to the sum of the WSH for each orginally assumed station-count.

Note that in practice it may be necessary to repeat Steps 3, 4, and 5 one or more times using other tentative station-counts (and/or utilization criteria) if the assigned station-counts of Step 5 yield a WSH capacity incompatible with the WSH data established in Step 1.

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required assignable square feet (ASF).

   Decisions must be made concerning which rooms will be lecture rooms, which will be regular classrooms, and which will be seminar rooms. For each of these the type of seating must be assumed. The seating configuration for each room must also be considered. All of these determinations help to fix the number of assignable square feet per station (ASF/N) which must be allowed. Section 2.4 of this manual lists some unit floor area criteria which vary by size of room as well as the type of seating. Multiplication of that value by the number of stations provides the assignable square feet for each room.

   Classroom service space, which includes such rooms as projection booths, lecture room preparation and storage areas, and so on, typically is determined by an analysis of the specific needs for such facilities (rather than as a percentage or other numerical function of classroom space).

COMMENT ON THE PROCEDURE:

The number of stations in each classroom is determined by use of the assumed (standard) station-utilization rate. In determining the station-utilization rate for each classroom three objectives must be kept in mind.

- Room-utilization standards require that each room be used to the fullest extent possible. The largest room, therefore, must accommodate not only the largest section but sufficient sections of a smaller size until an acceptable room-utilization level is is reached. Hence, even though the room may be equal in capacity to the size of the largest section, the empty seats resulting from smaller section sizes may reduce substantially the average level of station-occupancy.

- Design criteria suggest that classrooms be planned to modular increments. Even though there may be enough sections to warrant a classroom of 32 stations, and one of 31 stations, and one of 30 stations, and so on by increments of 1 station down to 25, nothing is gained by actually equipping rooms with precisely those numbers of stations, because architecturally, only one or two distinct room sizes are represented by rooms in that capacity range.

- Scheduling principles require that some excess seating capacity be available. First, the actual size of a section cannot be known in advance with absolute certainty even with a pre-registration system. Second, room capacities which too closely approximate section sizes will result in excessive relocation of sections after actual section sizes are known. Reasonable assurance that the originally scheduled classroom will be the actual "home" for a course permits effective planning of time-and-place considerations by both faculty and students.

The number of classrooms required is determined by applying the assumed (standard) room-utilization rate to weekly room-hours distributed by a projected station-count for each room. It is assumed that one room must be large enough to accommodate the largest section size. Within the constraints set by suitability, time, and distance, it is assumed that the largest room also will accommodate the next largest section, and the next largest, and so on until the desired level of room-utilization is met. Then a second room is required to accommodate the largest as-yet-unaccommodated section, as well as subsequently smaller sections, until again the room-utilization rate for rooms of that station-count is met. The process continues until the weekly room-hours for all sections requiring classroom space are accounted for.

In determining the room-utilization rate three considerations must be kept in mind:

- Location considerations require that faculty and students not be scheduled arbitrarily to classrooms which are located in remote areas.

- Specialized-use considerations require the use of classrooms for purposes other than instruction. Examples of such use are for set-up time in lecture-demonstration rooms, colloquia, non-credit seminars, meetings, and study space.

- Appropriateness-of-size considerations require that the number of stations in the room reasonably approximate the size of the section. The instructional climate of a very small section in a very large room generally is unacceptable. This consideration tends to reduce the level of room-utilization for large rooms.

The assignable square feet for each classroom is a design problem primarily based on the furniture and internal circulation space. Fixed theater seating and fixed pedestal-type, tablet-arm chairs usually require the least area per station; table-and-chair and informal-lounge types of seating usually require the most. The amount of within-the-room circulation space is influenced by the distance between stations, the amount of space allowed for the instructor, and the architectural modular design used. The required amount of classroom space usually is specified as assignable square feet per station. All of the space in the room, not only the space occupied by the furniture but also the internal circulation space, is included in that figure.

Classroom service space usually is a very small part of the total classroom space. It includes such rooms as projection booths in lecture rooms, preparation rooms associated with lecture-demonstration rooms and so on. No specific techniques or standards are proposed for projecting the amount of such space. The need for such space generally is recognized in the development of program statements for a particular building.

EXAMPLE
DETAILED METHOD
PROJECTION OF CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

Distribution of:

- the number of classrooms required (R),

indicating for each classroom

- the number of stations (station-count = N/R),
- the assignable square feet (ASF),

and for classroom service facilities

- the assignable square feet (ASF).

PROCEDURE:

1. Obtain from the program analysis procedure (discussed in Manual Six) these distributions:
    - weekly room-hours (WRH), by size of section (SS) and
    - weekly student-hours (WSH), by size of section (SS).

TABLE 2.5

PROJECTED WEEKLY ROOM-HOURS (WRH) AND WEEKLY STUDENT-HOUR (WSH), BY SIZE OF SECTION (SS)

SIZE OF SECTION	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS	SIZE OF SECTION	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS	SIZE OF SECTION	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
173	3	519	39	4	156	19	68	1292
135	3	405	38	5	190	18	82	1476
128	2	256	37	3	111	17	67	1139
91	4	364	36	8	288	16	51	816
75	6	450	35	8	280	15	41	615
57	5	285	34	8	272	14	28	392
56	5	280	33	7	231	13	31	403
53	10	530	32	18	576	12	33	396
51	2	102	31	24	744	11	36	396
50	3	150	30	37	1110	10	44	440
49	2	98	29	39	1131	9	30	270
48	3	144	28	36	1008	8	30	240
47	4	188	27	34	918	7	32	224
46	4	184	26	53	1378	6	28	168
45	3	135	25	59	1475	5	28	140
44	4	176	24	62	1488	4	23	92
43	3	129	23	67	1541	3	23	69
42	4	168	22	72	1584	2	24	48
41	4	164	21	74	1554	1	22	22
40	3	120	20	84	1680			
						TOTAL	1500	31200

NOTE: Table 2.5 exhibits projected weekly room-hours and weekly student-hours by size of section in greater detail than may be available in many instances. Nevertheless, whether these data are available for individual section-sizes, as illustrated, or only by ranges of section-sizes, the techniques in succeeding steps are essentially the same.

Further, it can only be assumed that projected data such as these will prove to be only moderately accurate. The adjustment for this variance from these projected values is accomplished in Steps 4 and 5.

2. Establish for each station-count, as a matter of institutional policy:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

TABLE 2.6

ASSUMED ROOM-UTILIZATION RATES, STATION-OCCUPANCY RATIOS, AND STATION-UTILIZATION RATES FOR VARIOUS STATION-COUNTS

STATION-COUNT	ASSUMED ROOM-UTILIZATION RATE	ASSUMED STATION-OCCUPANCY RATIO	ASSUMED STATION-UTILIZATION RATE
N/R	RUR	SOR	SUR*
201 and above	20	.45	9.0
151 - 200	22	.50	11.0
101 - 150	22	.50	11.0
91 - 100	26	.55	14.3
81 - 90	26	.55	14.3
76 - 80	26	.55	14.3
71 - 75	28	.60	16.8
66 - 70	28	.60	16.8
61 - 65	28	.60	16.8
56 - 60	28	.60	16.8
51 - 55	30	.60	18.0
46 - 50	30	.60	18.0
41 - 45	30	.60	18.0
36 - 40	30	.60	18.0
31 - 35	30	.70	21.0
26 - 30	30	.70	21.0
21 - 25	30	.75	22.5
16 - 20	30	.83	25.0
11 - 15	32	.65	20.8
1 - 10	32	.60	19.2

*SUR =(RUR)x(SOR)

NOTE: The utilization rates displayed in Table 2.6 are illustrative only and are not recommended as standards.

3. Determine:

- tentative station-count criteria and
- tentative station-counts

by application of

- the room-utilization rate (RUR)

to the

- distribution of weekly room-hours (WRH) by size of section (SS).

Inspection of the distribution of projected WRH and WSH on Table 2.5 indicates the largest section will be 173. Tentatively, a room with 200 stations is set as the largest room. Rooms of that capacity should be scheduled 22 hours per week according to Table 2.6. That suggests the next largest room size would need to accommodate a section of 57 students. However, the 200 capacity room is not deemed suitable for sections that small, and for other institutional requirements (faculty meetings, colloquia, extra-curricular programs, etc.) suggest the need for a room with 100 stations. Thus, the next largest room is tentatively set at 100 stations. It is further assumed, in this example, that rooms will be built in multiples of at least 10 stations. These tentative station-counts are set, along with the assumed room-utilization rate:

Station Count N/R	Room-Utilization Rate RUR
200	22
100	26
60	28
40	30
30	30
20	30
10	32

These utilization rates, taken from Table 2.6, are then used to determine the required number of rooms for each station-count:

TABLE 2.7

NUMBER OF ROOMS REQUIRED FOR EACH TENTATIVE STATION-COUNT AND WEEKLY STUDENT-HOURS PER ROOM

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	200	22	173	3	3	519
			135	3	6	405
			128	2	8	256
			91	4	12	364
			75	6	18	450
			57	4	22	228
				22		2222
				5*		285*
1	100	26	57	1	1	57
			56	5	6	280
			53	10	16	530
			51	2	18	102
			50	3	21	150
			49	2	23	98
			48	3	26	144
				26		1361
1	60	28	47	4	4	188
			46	4	8	184
			45	3	11	135
			44	4	15	176
			43	3	18	129
			42	4	22	168
			41	4	26	164
			40	2	28	80
				28		1224
				3		120
1	40	30	40	1	1	40
			39	4	5	156
			38	5	10	190
			37	3	13	111
			36	8	21	288
			35	8	29	280
			34	1	30	34
				30		1099
				8		272

*See footnote at conclusion of Table 2.7

TABLE 2.7 (Continued)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	40	30	34 33 32	7 7 16 30	7 14 30	238 231 512 981
1	40	30	32 31 30	18* 2 24 4 30	2 26 30	576* 64 744 120 928
1	30	30	30	30 37	30	900 1110
1	30	30	30 29	3 27 30	3 30	90 783 873
1	30	30	29 28	39 12 18 30	12 30	1131 348 504 852
1	30	30	28 27	36 18 12 30	18 30	1008 504 324 828
1	30	30	27 26	34 22 8 30	22 30	918 594 208 802
1	30	30	26	30 53	30	780 1378
1	30	30	26 25	15 15 30	15 30	390 375 765
1	30	30	25	30 59	30	750 1475
1	30	30	25 24	14 16 30	14 30	350 384 734
1	30	30	24	30 62	30	720 1488
1	30	30	24 23	16 14 30	16 30	384 322 706

*See footnote at conclusion of Table 2.7.

TABLE 2.7 (Continued)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	30	30	23	30 67*	30	690 1541*
1	30	30	23 22	23 7 30	23 30	529 154 683
1	30	30	22	30 67	30	660 1584
1	30	30	22	30	30	660
1	30	30	22 21	5 25 30	5 30	110 525 635
1	30	30	21	30 74	30	630 1554
1	30	30	21 20	19 11 30	19 30	399 220 619
1	20	30	20	30 84	30	600 1680
1	20	30	20	30	30	600
1	20	30	20 19	13 17 30	13 30	260 323 583
1	20	30	19	30 68	30	570 1292
1	20	30	19 18	21 9 30	21 30	399 162 561
1	20	30	18	30 82	30	540 1476
1	20	30	18	30	30	540

*See footnote at conclusion of Table 2.7.

TABLE 2.7 (Continued)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	20	30	18 17	13 17 30	13 30	234 289 523
1	20	30	17	30 67	30	510 1139
1	20	30	17 16	20 10 30	20 30	340 160 500
1	20	30	16	30 51*	30	480 816*
1	20	30	16 15	11 19 30 41	11 30	176 285 461 615
1	20	30	15 14	22 8 30 28	22 30	330 112 442 392
1	20	30	14 13	20 10 30 31	20 30	280 130 410 403
1	20	30	13 12	21 9 30 33	21 30	273 108 381 396
1	20	30	12 11	24 6 30 36	24 30	288 66 354 396
1	20	30	11	30	30	330
1	10	32	10	32 44	32	320 440
1	10	32	10 9	12 20 32 30	12 32	120 180 300 270

*See footnote at conclusion of Table 2.7.

TABLE 2.7 (Conclusion)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	10	32	9 8	10 22 32	10 32	90 176 266
				30		240
1	10	32	8 7	8 24 32	8 32	64 168 232
				32		224
1	10	32	7 6	8 24 32	8 32	56 144 200
				28		168
1	10	32	6 5	4 28 32	4 32	24 140 164
1	10	32	4 3	23 9 32	23 32	92 27 119
				23*		69*
1	10	32	3 2	14 18 32	14 18	42 36 78
				24		48
1	10	32	2 1	6 22 28	6 28	12 22 34

*The brackets throughout Table 2.7 are used to indicate that the projected WRH and WSH indicated on Table 2.5 are all accounted for. For example, the 5 WRH projected for sections of 57 students are divided between rooms of two different station-counts: 4 WRH in a room of 200 stations and 1 WRH in a room of 100 stations. In practice, such a split may be impractical, because all 5 WRH may be associated with a single course (or two courses with a 3 to 2 split).

* * *

Table 2.7 illustrates the process of determining the required number of classrooms using the most detailed procedure possible. The procedure implies that the assumed RUR is the most important criterion; thus, for each projected classroom the total number of WRH equals the assumed RUR. In practice, both the level of detail and the rigidity of the RUR assumption may require modification.

It should also be noted that the only purpose of this analysis is to determine the required number of rooms. Thus, the apparent assumptions that 100 per cent station utilization will occur in certain instances (for example, 1 WRH of 40 students in a room of 40 seats, 33 WRH of 30 students in 2 rooms of 30 seats, etc.) is modified in Steps 4 and 5 where the station-utilization rate is used to determine the actual station-count for the rooms.

* * *

The detailed data of Table 2.7 are summarized in the first three columns of Table 2.8.

4. Adjust the tentatively assumed station-count (N/R) by use of the station-utilization rate (SUR):

TABLE 2.8

ADJUSTED STATION-COUNTS PER ROOM

NUMBER OF ROOMS	ASSUMED STATION-COUNT	WEEKLY STUDENT-HOURS	STATION-UTILIZATION RATE	CALCULATED STATION-COUNT	STATION-COUNT PER ROOM
R	N/R	WSH	SUR	$N = \frac{WSH}{SUR}$	N/R
1	200	2,222	11.0	202	202
1	100	1,361	14.3	95	95
1	60	1,224	16.8	73	73
3	40	3,008	18.0	167	56
18	30	13,287	21.0	633	35
17	20	8,385	25.0	335	19
9	10	1,713	19.2	89	10
TOTALS 50	---	31,200	----	1,594	----

Note: The first three columns of Table 2.8 are summarized from Table 2.7 the fourth column is taken from Table 2.6. The last two columns are calculated as shown.

5. Assign a final station-count per room (N/R) and check the weekly student-hour capacity (WSH_c) of the proposed distribution:

TABLE 2.9

ASSIGNED STATION-COUNTS PER ROOM

NUMBER OF ROOMS	ASSIGNED STATION-COUNT PER ROOM	TOTAL STATIONS	STATION-UTILIZATION RATE	WEEKLY STUDENT-HOUR CAPACITY BASED UPON: ASSIGNED STATION-COUNT	ASSUMED STATION-COUNT
R	N/R	N	SUR	WSH	WSH
1	200	200	11.0	2,200	2,222
1	100	100	14.3	1,430	1,361
1	75	75	16.8	1,260	1,224
3	55	165	18.0	2,970	3,008
18	35	630	21.0	13,230	13,287
17	20	340	25.0	8,500	8,385
9	10	90	19.2	1,728	1,713
TOTALS 50	----	1,600	----	31,318	31,200

Note: The second column of Table 2.9 represents an arbitrary rounding (to modular numbers) of the last column in Table 2.8. The third column is the mathematical product of the first two. The fourth column is taken from Table 2.6. The fifth column is the mathematical product of the third and fourth (WSH = N x SUR). The final column is summarized from Table 2.7 and is identical to the third column of Table 2.8.

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required assignable square feet (ASF).

TABLE 2.10

DISTRIBUTION OF CLASSROOMS BY NUMBER OF STATIONS AND ASSIGNABLE SQUARE FEET AND CLASSROOM SERVICE BY ASSIGNABLE SQUARE FEET

Classrooms:

TYPE OF ROOM	STATION-COUNT	NUMBER OF ROOMS	ASSIGNABLE SQUARE FEET PER STATION	ASSIGNABLE SQUARE FEET PER ROOM	TOTAL STATIONS	TOTAL ASSIGNABLE SQUARE FEET
	N/R	R	ASF/N	ASF/R = N/R x ASF/N	N = N/R x R	ASF = ASF/N x R
Lecture	200	1	10	2,000	200	2,000
Lecture	100	1	12	1,200	100	1,200
Classroom	75	1	14	1,050	75	1,050
Classroom	55	3	14	770	165	2,310
Classroom	35	9	16	560	315	5,040
Seminar	35	9	20	700	315	6,300
Seminar	20	17	25	500	340	8,500
Seminar	10	9	25	250	90	2,250
SUBTOTALS	---	50	--	-----	1,600	28,650
Projection Room	---	1	--	-----	-----	150
TOTALS	---	51	--	-----	1,600	28,800

Note: The assignable square feet per station in Table 2.10 are illustrative only and are not recommended as standards.

DISCUSSION

DETAILED METHOD

PROJECTION OF CLASSROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

Distribution of the:

- additional number of classrooms required (R),

indicating for each additional classroom

- the number of stations (station-count = N/R), and
- the assignable square feet (ASF)

and for classroom service facilities

- the assignable square feet (ASF).

PROGRAM DATA REQUIRED:

- a distribution of projected classroom weekly room-hours (WRH), by size of section (SS),

which implies:

- a distribution of projected classroom weekly student hours, by size of section (SS).

These distributions are derived from:

- projected course enrollments

distributed by:

- size of classroom section, and
- number of classroom hours of instruction required, per section.

FACILITIES DATA REQUIRED:

A distribution of:

- the number of existing classrooms

indicating for each existing classroom

- the number of stations (station-count) and
- the assignable square feet

and for existing class laboratory facilities

- the assignable square feet.

ADDITIONAL FACILITIES DATA:

If the evaluation includes an assessment of the capability of existing classrooms to accommodate additional stations (or the desirability of reducing the station-count), then these data may be helpful:

- information on type of furniture,
- floor plans for each room, and/or
- schematic drawings of typical furniture arrangements, either drawn to scale or showing essential dimensions.

UTILIZATION ASSUMPTIONS REQUIRED:

For each classroom:

- a room-utilization rate (RUR),
- a station-occupancy ratio (SOR), and
- the number of assignable square feet per station (ASF/N).

PROCEDURE:

1. Obtain from the program analysis procedure (discussed in Manual Six) these distributions:

   - weekly room-hours (WRH), by size of section (SS), and
   - weekly student-hours (WSH), by size of section (SS).

   These data are illustrated on Table 2.11.

2. Establish for each station-count as a matter of institutional policy:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

   These utilization criteria may be average values applied to all rooms and stations, or specific values applied to each room and/or to each station count. The use of specific values is illustrated on Table 2.12.

3. Determine:

- tentative station-count criteria, and
- tentative station-counts

by application of

- the room-utilization rate (RUR)

to the

- distribution of weekly room-hours (WRH), by size of section (SS).

Inspection of the distribution of projected weekly room-hours (WRH) by size of section (SS) provides the basis for determining a tentative station-count distribution. For example, the largest room must be at least equal in number of stations (station-count) to the largest projected section size. It may be assumed that smaller sections will be scheduled in that room up to the level of its room-utilization rate. For academic and/or other reasons some of the smaller sections may not be appropriate to the largest room. In this case, the station-count of the next-to-the-largest room may be placed at a higher value than actually is required by the distribution of weekly room-hours by size of section.

Other restrictions may be placed on the distribution of station counts. For example, it may be assumed that room station-counts will be in multiples of 10 (or 5, or any set of numbers).

After the distribution of tentative station-counts is determined, the number of rooms for each tentative station-count is calculated. This is accomplished by the successive accumulation of weekly room-hours up to the level of the room-utilization rate set for a room of that capacity. After that room has been "used" to its full rate, then another room is assumed. When the accumulation of weekly room-hours for that room meets the full utilization rate for that room, another room is assumed to be needed. The process continues until all weekly room-hours are accommodated in rooms appropriate to the section size at which the weekly room-hours occur. The final result is a distribution of number of rooms required for each tentatively assumed station-count.

4. Adjust the tentatively assumed station-count (N/R) by use of the station-utilization rate (SUR).

   The distribution of rooms by station-count which resulted from the calculations in Step 3 assumes that absolute scheduling flexibility is possible. Because such flexibility is not possible, it is necessary to adjust the tentative station-counts to the assumed station-utilization rate (SUR).

   The adjustment is accomplished by dividing the number of projected weekly student-hours (WSH) at each assumed station-count by the assumed station-utilization rate (SUR). The result is converted to a station-count per room by dividing by the number of rooms.

5. Assign a final station-count per room (N/R) and check the weekly student-hour capacity (WSH_c) of the proposed distribution.

   The calculated station-count per room (N/R) in Step 4 yields uneven, non-modular numbers. These are modified generally to create a set of modular numbers appropriate to classroom-design considerations.

   Because the station-utilization rate (SUR) in Step 4 was applied to tentatively assumed station-counts, it must now be applied to the finally assigned station-counts. Multiplication of the appropriate station-utilization rate by the total number of stations for each station-count provides the number of weekly student-hours each room size will accommodate. The total WSH should be approximately equal to the projected WSH and the subtotals for each station-count should be approximately equal to the sum of the WSH for each orginally assumed station-count.

   Note that in practice it may be necessary to repeat Steps 3, 4, and 5 one or more times using other tentative station-counts (and/or utilization criteria) if the assigned station-counts of Step 5 yield a WSH capacity incompatible with the WSH data established in Step 1.

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required assignable square feet (ASF).

   Decisions must be made concerning which rooms will be lecture rooms, which will be regular classrooms, and which will be seminar rooms. For each of these the type of seating must be assumed. The seating configuration for each room must also be considered. All of these determinations help to fix the number of assignable square feet per station (ASF/N) which must be allowed. Section 2.4 of this manual lists some unit floor area criteria which vary by size of room as well as the type of seating. Multiplication of that value by the number of stations provides the assignable square feet for each room.

Classroom service facilities, which includes such rooms as projection booths, lecture room preparation and storage areas, and so on, typically is determined by an analysis of the specific needs for such facilities (rather than as a percentage or other numerical function of classroom space).

7. Compare the existing with the projected distribution of rooms by number of stations (N), and determine the required number of additional classrooms (R) by station-counts.

   In some instances, an "excess" of classrooms of certain station-counts may exist on the basis of projected data. Two courses of action are possible. One is to continue to use the classrooms at their present station-count. In effect, this lowers the station-occupancy ratio below assumed (standard) levels. The other is to modify the number of stations either by removal of seats or by remodeling the space so that rooms of the desirable station-count and assignable square feet are created.

8. Determine the additional number of classrooms (R) required, the number of stations in each room (N/R), and the assignable square feet (ASF).

COMMENT ON THE PROCEDURE:

See the comment section in the previous procedure for new institutions, Section 2.12.

Note also that procedure outlined above makes no assumption about the quality of the existing classroom facilities. If some of the existing classroom space is of such poor quality that it will be abandoned or converted to other uses between the present time and the point in time to which the projected program data apply, then the "existing" facilities assumed in Step 7 should be adjusted to reflect only the classrooms which will still exist at the time assumed as the target year for the projected program data.

EXAMPLE

DETAILED METHOD

PROJECTION OF CLASSROOM REQUIREMEMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

Distribution of the:

- additional number of classrooms required (R)

indicating for each additional classroom

- the number of stations (station-count = N/R), and
- the assignable square feet (ASF)

and for classroom service facilities

- the assignable square feet (ASF).

PROCEDURE:

1. Obtain from the program analysis procedure (discussed in Manual Six) these distributions:
    - weekly room-hours (WRH), by size of section (SS), and
    - weekly student-hours (WSH), by size of section (SS).

TABLE 2.11

PROJECTED WEEKLY ROOM-HOURS (WRH) AND WEEKLY STUDENT-HOUR (WSH), BY SIZE OF SECTION (SS)

SIZE OF SECTION	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS	SIZE OF SECTION	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS	SIZE OF SECTION	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
173	3	519	39	4	156	19	68	1292
135	3	405	38	5	190	18	82	1476
128	2	256	37	3	111	17	67	1139
91	4	364	36	8	288	16	51	816
75	6	450	35	8	280	15	41	615
57	5	285	34	8	272	14	28	392
56	5	280	33	7	231	13	31	403
53	10	530	32	18	576	12	33	396
51	2	102	31	24	744	11	36	396
50	3	150	30	37	1110	10	44	440
49	2	98	29	39	1131	9	30	270
48	3	144	28	36	1008	8	30	240
47	4	188	27	34	918	7	32	224
46	4	184	26	53	1378	6	28	158
45	3	135	25	59	1475	5	28	140
44	4	176	24	62	1488	4	23	92
43	3	129	23	67	1541	3	23	69
42	4	168	22	72	1584	2	24	48
41	4	164	21	74	1554	1	22	22
40	3	120	20	84	1680			
						TOTAL	1500	31200

NOTE: Table 2.11 exhibits projected weekly room-hours and weekly student-hours by size of section in greater detail than may be available in many instances. Nevertheless, whether these data are available for individual section-sizes, as illustrated, or only by ranges of section-sizes, the techniques in succeeding steps are essentially the same.

Further, it can only be assumed that projected data such as these will prove to be only moderately accurate. The adjustment for this variance from these projected values is accomplished in Steps 4 and 5.

2. Establish for each station-count, as a matter of institutional policy:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

   The mathematical product of these two utilization values equals:

   - a station-utilization rate (SUR).

TABLE 2.12

ASSUMED ROOM-UTILIZATION RATES, STATION-OCCUPANCY RATIOS, AND STATION-UTILIZATION RATES FOR VARIOUS STATION-COUNTS

STATION-COUNT	ASSUMED ROOM-UTILIZATION RATE	ASSUMED STATION-OCCUPANCY RATIO	ASSUMED STATION-UTILIZATION RATE
N/R	RUR	SOR	SUR*
201 and above	20	.45	9.0
151 - 200	22	.50	11.0
101 - 150	22	.50	11.0
91 - 100	26	.55	14.3
81 - 90	26	.55	14.3
76 - 80	26	.55	14.3
71 - 75	28	.60	16.8
66 - 70	28	.60	16.8
61 - 65	28	.60	16.8
56 - 60	28	.60	16.8
51 - 55	30	.60	18.0
46 - 50	30	.60	18.0
41 - 45	30	.60	18.0
36 - 40	30	.60	18.0
31 - 35	30	.70	21.0
26 - 30	30	.70	21.0
21 - 25	30	.75	22.5
16 - 20	30	.83	25.0
11 - 15	32	.65	20.8
1 - 10	32	.60	19.2

*SUR =(RUR)x(SOR)

NOTE: The utilization rates displayed in Table 2.12 are illustrative only and are not recommended as standards.

3. Determine:

- tentative station-count criteria and
- tentative station-counts

by application of

- the room-utilization rate (RUR)

to the

- distribution of weekly room-hours (WRH), by size of section (SS).

Inspection of the distribution of projected WRH and WSH on Table 2.11 indicates the largest section will be 173. Tentatively, a room with 200 stations is set as the largest room. Rooms of that capacity should be scheduled 22 hours per week according to Table 2.6. That suggests the next largest room size would need to accommodate a section of 57 students. However, the 200 capacity room is not deemed suitable for sections that small, and for other institutional requirements (faculty meetings, colloquia, extra-curricular programs, etc.) suggest the need for a room with 100 stations. Thus, the next largest room is tentatively set at 100 stations. It is further assumed, in this example, that rooms will be built in multiples of at least 10 stations. These tentative station-counts are set, along with the assumed room-utilization rate:

Station Count	Room-Utilization Rate
N/R	RUR
200	22
100	26
60	28
40	30
30	30
20	30
10	32

These utilization rates, taken from Table 2.12, are then used to determine the required number of rooms for each station-count:

TABLE 2.13

NUMBER OF ROOMS REQUIRED FOR EACH TENTATIVE STATION-COUNT AND WEEKLY STUDENT-HOURS PER ROOM

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	200	22	173	3	3	519
			135	3	6	405
			128	2	8	256
			91	4	12	364
			75	6	18	450
			57	4	22	228
				22		2222
				5*		285*
1	100	26	57	1	1	57
			56	5	6	280
			53	10	16	530
			51	2	18	102
			50	3	21	150
			49	2	23	98
			48	3	26	144
				26		1361
1	60	28	47	4	4	188
			46	4	8	184
			45	3	11	135
			44	4	15	176
			43	3	18	129
			42	4	22	168
			41	4	26	164
			40	2	28	80
				28		1224
				3		120
1	40	30	40	1	1	40
			39	4	5	156
			38	5	10	190
			37	3	13	111
			36	8	21	288
			35	8	29	280
			34	1	30	34
				30		1099
				8		272

*See footnote at conclusion of Table 2.13.

TABLE 2.13 (Continued)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	40	30	34	7	7	238
			33	7	14	231
			32	16	30	512
				30		981
				18*		576*
1	40	30	32	2	2	64
			31	24	26	744
			30	4	30	120
				30		928
1	30	30	30	30 37	30	900 1110
1	30	30	30	3	3	90
			29	27	30	783
				30		873
				39		1131
1	30	30	29	12	12	348
			28	18	30	504
				30		852
				36		1008
1	30	30	28	18	18	504
			27	12	30	324
				30		828
				34		918
1	30	30	27	22	22	594
			26	8	30	208
				30		802
1	30	30	26	30 53	30	780 1378
1	30	30	26	15	15	390
			25	15	30	375
				30		765
1	30	30	25	30 59	30	750 1475
1	30	30	25	14	14	350
			24	16	30	384
				30		734
1	30	30	24	30 62	30	720 1488
1	30	30	24	16	16	384
			23	14	30	322
				30		706

*See footnote at conclusion of Table 2.13.

TABLE 2.13 (Continued)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	30	30	23	30 67*	30	690 1541*
1	30	30	23 22	23 7 30	23 30	529 154 683
1	30	30	22	30 67	30	660 1584
1	30	30	22	30	30	660
1	30	30	22 21	5 25 30	5 30	110 525 635
1	30	30	21	30 74	30	630 1554
1	30	30	21 20	19 11 30	19 30	399 220 619
1	20	30	20	30 84	30	600 1680
1	20	30	20	30	30	600
1	20	30	20 19	13 17 30	13 30	260 323 583
1	20	30	19	30 68	30	570 1292
1	20	30	19 18	21 9 30	21 30	399 162 561
1	20	30	18	30 82	30	540 1476
1	20	30	18	30	30	540

*See footnote at conclusion of Table 2.13.

TABLE 2.13 (Continued)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	20	30	18 17	13 17 30	13 30	234 289 523
1	20	30	17	30 67	30	510 1139
1	20	30	17 16	20 10 30	20 30	340 160 500
1	20	30	16	30 51*	30	480 816*
1	20	30	16 15	11 19 30 41	11 30	176 285 461 615
1	20	30	15 14	22 8 30 28	22 30	330 112 442 392
1	20	30	14 13	20 10 30 31	20 30	280 130 410 403
1	20	30	13 12	21 9 30 33	21 30	273 108 381 396
1	20	30	12 11	24 6 30 36	24 30	288 66 354 396
1	20	30	11	30	30	330
1	10	32	10	32 44	32	320 440
1	10	32	10 9	12 20 32 30	12 32	120 180 300 270

*See footnote at conclusion of Table 2.13.

TABLE 2.13 (Conclusion)

NUMBER OF ROOMS	TENTATIVE STATION-COUNT	ASSUMED ROOM UTILIZATION RATE	SECTION SIZE	WEEKLY ROOM-HOURS	CUMULATIVE WEEKLY ROOM-HOURS	WEEKLY STUDENT HOURS
R	N/R	RUR	SS	WRH	CUM WRH	WSH
1	10	32	9 8	10 22 32	10 32	90 176 266
				30		240
1	10	32	8 7	8 24 32	8 32	64 168 232
				32		224
1	10	32	7 6	8 24 32	8 32	56 144 200
				28		168
1	10	32	6 5	4 28 32	4 32	24 140 164
1	10	32	4 3	23 9 32	23 32	92 27 119
				23*		69*
1	10	32	3 2	14 18 32	14 18	42 36 78
				24		48
1	10	32	2 1	6 22 28	6 28	12 22 34

* * *   * * *

*The brackets throughout Table 2.13 are used to indicate that the projected WRH and WSH indicated on Table 2.13 are all accounted for. For example, the 5 WRH projected for sections of 57 students are divided between rooms of two different station-counts: 4 WRH in a room of 200 stations and 1 WRH in a room of 100 stations. In practice, such a split may be impractical, because all 5 WRH may be associated with a single course (or two courses with a 3 to 2 split).

* * *

Table 2.13 illustrates the process of determining the required number of classrooms using the most detailed procedure possible. The procedure implies that the assumed RUR is the most important criterion; thus, for each projected classroom the total number of WRH equals the assumed RUR. In practice, both the level of detail and the rigidity of the RUR assumption may require modification.

It should also be noted that the only purpose of this analysis is to determine the required number of rooms. Thus, the apparent assumptions that 100 per cent station utilization will occur in certain instances (for example, 1 WRH of 40 students in a room of 40 seats, 33 WRH of 30 students in 2 rooms of 30 seats, etc.) is modified in Steps 4 and 5 where the station-utilization rate is used to determine the actual station-count for the rooms.

* * *

The detailed data of Table 2.13 are summarized in the first three columns of Table 2.14.

4. Adjust the tentatively assumed station-count (N/R) by use of the station-utilization rate (SUR):

TABLE 2.14

ADJUSTED STATION-COUNTS PER ROOM

NUMBER OF ROOMS	ASSUMED STATION-COUNT	WEEKLY STUDENT-HOURS	STATION-UTILIZATION RATE	CALCULATED STATION-COUNT	STATION-COUNT PER ROOM
R	N/R	WSH	SUR	$N = \frac{WSH}{SUR}$	N/R
1	200	2,222	11.0	202	202
1	100	1,361	14.3	95	95
1	60	1,224	16.8	73	73
3	40	3,008	18.0	167	56
18	30	13,287	21.0	633	35
17	20	8,385	25.0	335	19
9	10	1,713	19.2	89	10
TOTALS 50	---	31,200	----	1,594	----

Note: The first three columns of Table 2.14 are summarized from Table 2.13 the fourth column is taken from Table 2.12. The last two columns are calculated as shown.

5. Assign a final station-count per room (N/R) and check the weekly student-hour capacity (WSH_c) of the proposed distribution:

TABLE 2.15

ASSIGNED STATION-COUNTS PER ROOM

NUMBER OF ROOMS	ASSIGNED STATION-COUNT PER ROOM	TOTAL STATIONS	STATION-UTILIZATION RATE	WEEKLY STUDENT-HOUR CAPACITY BASED UPON:	
				ASSIGNED STATION-COUNT	ASSUMED STATION-COUNT
R	N/R	N	SUR	WSH	WSH
1	200	200	11.0	2,200	2,222
1	100	100	14.3	1,430	1,361
1	75	75	16.8	1,260	1,224
3	55	165	18.0	2,970	3,008
18	35	630	21.0	13,230	13,287
17	20	340	25.0	8,500	8,385
9	10	90	19.2	1,728	1,713
TOTALS 50	----	1,600	----	31,318	31,200

Note: The second column of Table 2.15 represents an arbitrary rounding (to modular numbers) of the last column in Table 2.14. The third column is the mathematical product of the first two. The fourth column is taken from Table 2.12. The fifth column is the mathematical product of the third and fourth (WSH = N x SUR). The final column is summarized from Table 2.13 and is identical to the third column of Table 2.14.

6. Determine the design criteria, establish the need for classroom service areas, and calculate the required assignable square feet (ASF).

TABLE 2.16

DISTRIBUTION OF CLASSROOMS BY NUMBER OF STATIONS AND ASSIGNABLE SQUARE FEET AND CLASSROOM SERVICE BY ASSIGNABLE SQUARE FEET

Classrooms:

TYPE OF ROOM	STATION-COUNT	NUMBER OF ROOMS	ASSIGNABLE SQUARE FEET PER STATION	ASSIGNABLE SQUARE FEET PER ROOM	TOTAL STATIONS	TOTAL ASSIGNABLE SQUARE FEET
	N/R	R	ASF/N	ASF/R = N/R x ASF/N	N = N/R x R	ASF = ASF/N x R
Lecture	200	1	10	2,000	200	2,000
Lecture	100	1	12	1,200	100	1,200
Classroom	75	1	14	1,050	75	1,050
Classroom	55	3	14	770	165	2,310
Classroom	35	9	16	560	315	5,040
Seminar	35	9	20	700	315	6,300
Seminar	20	17	25	500	340	8,500
Seminar	10	9	25	250	90	2,250
SUBTOTALS	---	50	--	-----	1,600	28,650
Projection Room	---	1	--	-----	-----	150
TOTALS	---	51	--	-----	1,600	28,800

Note: The assignable square feet per station in Table 2.16 are illustrative only and are not recommended as standards.

7. Compare the existing with the projected distribution of rooms by number of stations (N), and determine the required number of additional classrooms (R) by station-count.

TABLE 2.17

REQUIRED NUMBER OF ADDITIONAL CLASSROOMS (R) BY STATION-COUNT

STATION-COUNT	NUMBER OF ROOMS (R)			NUMBER OF STATIONS (N)		
	PROJECTED	EXISTING	DIFFERENCE	PROJECTED	EXISTING	DIFFERENCE
200	1	1	--	200	200	---
100	1	1	--	100	100	---
75	1	1	--	75	75	---
55	3	3	--	165	165	---
35	9	4	5	315	140	175
35	9	6	3	315	210	105
20	17	17	--	340	340	---
10	9	7	2	90	70	20
TOTALS	50	40	10	1,600	1,300	300

Note that in practice "existing" facilities may need to be adjusted to reflect the future abandonment of currently used classroom space.

8. Determine the additional number of classrooms (R) required, the number of stations in each room (N/R) and the assignable square feet (ASF).

TABLE 2.18
NUMBER OF NEW CLASSROOMS REQUIRED (R) BY STATION-COUNT (N/R), ASSIGNABLE SQUARE FEET PER STATION (ASF/N), ASSIGNABLE SQUARE FEET PER ROOM (ASF/R), TOTAL STATIONS (N) AND TOTAL ASSIGNABLE SQUARE FEET (ASF)

TYPE OF ROOM	STATION-COUNT	NUMBER OF ROOMS	ASSIGNABLE SQUARE FEET PER STATION	ASSIGNABLE SQUARE FEET PER ROOM	TOTAL STATIONS	TOTAL ASSIGNABLE SQUARE FEET
	N/R	R	ASF/N	ASF/R = N/R X ASF/N	N	ASF = ASF/R x R
Classroom	35	5	16	560	175	2,800
Seminar	35	3	20	700	105	2,100
Seminar	10	2	25	250	20	500
TOTALS	--	10	--	---	300	5,400
Classroom Service	--	--	--	---	---	-----

INTRODUCTORY COMMENTS

GENERAL PLANNING METHOD A

General planning methods such as those described on the succeeding pages can be very useful. They can also be misused easily and therefore may be dangerous in the hands of the novice. The limitations of these general planning methods are so severe that their use should be restricted to those institutions which can monitor constantly the validity of the assumptions involved. When such validity can be assured, general planning methods serve as adequate "rule-of-thumb" estimates of over-all classroom requirements. If, however, the application of general planning methods results in a decision to add, alter, or abandon existing classrooms, then these general estimates must be modified by a complete analysis as outlined in the preceding DETAILED METHOD section.

General planning methods rely entirely on averages and yield only total numbers. They assume an average room-utilization rate for all classrooms and an average station-occupancy ratio for all stations. In the evaluation of existing space they yield only total weekly room-hours and total weekly student-hours; for projections of classroom requirements for a new institution they provide only the total number of rooms, stations, and assignable square feet; for projection of classroom requirements for an existing institution they provide only the total additional number of rooms, stations, and assignable square feet.

DISCUSSION
GENERAL PLANNING METHOD A
EVALUATION OF TOTAL EXISTING CLASSROOM CAPACITY

DATA TO BE DETERMINED:

The total number of:

- weekly room-hours (WRH), and
- weekly student-hours (WSH)

which existing classrooms can accommodate.

PROGRAM DATA REQUIRED:

- None

FACILITIES DATA REQUIRED:

- Total number of existing classrooms
- Total number of existing classroom stations
- Total number of existing classroom assignable square feet, including classroom service facilities.

UTILIZATION ASSUMPTIONS REQUIRED:

- An average room-utilization rate (RUR)
- An average station-occupancy ratio (SOR)
- An average number of assignable square feet per classroom station, including classroom service facilities (ASF/N).

PROCEDURE:

1. Obtain the facilities data:
    - Total number of existing classrooms
    - Total number of stations in existing classrooms
    - Total assignable square feet in existing classrooms, including classroom service areas

2. Establish as a matter of institutional policy:

    - an average room-utilization rate (RUR),
    - an average station-occupancy ratio (SOR), and
    - an average number of assignable square feet per station, including classroom service facilities (ASF/N).

3. Determine the total number of weekly room-hours (WRH) which can be accommodated in existing classrooms.

    This weekly room-hour capacity (WRH_c) is the mathematical product of the number of rooms (R) and the average room-utilization rate (RUR):

    Weekly Room-Hour Capacity = (Number of Rooms) x (Average RUR)

    $$WRH_c = (R) \times (RUR)$$

4. Determine the total number of weekly student-hours (WSH) which can be accommodated in existing classrooms.

    This weekly student-hour capacity (WSH_c) is the mathematical product of the total number of stations (N) and the average station-utilization rate (SUR):

    Weekly Student-Hour Capacity = (Number of Stations) x (Station-Utilization Rate)*

    $$WSH_c = (N) \times (SUR)$$

    *SUR = (RUR) x (SOR)

5. Alternate to Step 4.

    An alternate method for determining the total number of weekly student-hours which can be accommodated in existing classroom space involves the use of the ratio of assignable square feet to weekly student-hours (ASF/WSH). In addition to an assumed room-utilization rate (RUR) and an assumed station-occupancy ratio (SOR), an average number of square feet per classroom station (including classroom service areas) must be assumed. The assignable square feet per weekly student-hour ratio is derived as follows:

    $$\text{Assignable Square Feet per Weekly Student-Hour} = \frac{\text{(Average Assignable Square Feet per Station)}}{\text{(Average Room-Utilization Rate)} \times \text{(Station-Occupancy Ratio)}}$$

    $$ASF/WSH = \frac{(ASF/N)}{(RUR) \times (SOR)}$$

    $$= \frac{(ASF/N)}{(SUR)}$$

The number of weekly student-hours which a given number of assignable square feet of classroom space can accommodate is then estimated by dividing those square feet by the ASF/WSH ratio.

Note that this alternate method yields a greater WSH$_c$ than indicated by Step 4. This results from the assignable square feet per station (ASF/N) value. The calculations in Step 4 required no ASF/N assumption. The calculations in Step 5 were based on an assumed value of 17.5 assignable square feet per station. In reality 18.0 ASF/N actually existed, implying more stations could be placed (theoretically) in existing space.

COMMENT ON THE PROCEDURE:

See the introductory comments on General Planning Method A for the limitations of this procedure for analyzing classroom capacity (Section 2.2).

Note also that this procedure makes no assumption about the quality of the classroom space. Classroom facilities judged to be of such poor quality that they should be abandoned ought to be subtracted from the "existing" facilities assumed in Step 1 of the PROCEDURE.

EXAMPLE

GENERAL PLANNING METHOD A

EVALUATION OF TOTAL EXISTING CLASSROOM CAPACITY

DATA TO BE DETERMINED:

The total number of

- weekly room-hours (WRH), and
- weekly student-hours (WSH)

which existing classrooms can accommodate.

PROCEDURE:

1. Obtain the facilities data:
   - total number of existing classrooms = 40 classrooms
   - total number of existing stations = 1,300 stations
   - total assignable square feet in existing classrooms, including classroom service facilities = 23,400 assignable square feet
2. Establish as a matter of institutional policy:
   - an average room-utilization rate = 30 hours per week
   - an average station-occupancy ratio = .65
   - an average number of square feet per classroom station, including classroom service facilities = 17.5 assignable square feet per station
3. Determine the total number of weekly room-hours (WRH) which can be accommodated in existing classrooms:

$$WRH_c = (R) \times (RUR)$$

$$= (40) \times (30)$$

$$= 1{,}200 \text{ weekly room-hours}$$

4. Determine the total number of weekly student-hours (WSH) which can be accommodated in existing classrooms.

$$\begin{aligned} WSH_c &= (N) \times (SUR) \\ &= (1{,}300) \times (30 \times .65)^* \\ &= 25{,}350 \text{ weekly student-hours} \end{aligned}$$

*SUR = (RUR) x (SOR)

5. Alternate to Step 4:

$$WSH_c = \frac{(ASF)}{(ASF)/(WSH)}$$

in which

$$ASF/WSH = \frac{(ASF/N)}{(RUR) \times (SOR)}$$

$$\begin{aligned} WSH_c &= \frac{(ASF)}{(ASF/N)} \times (RUR) \times (SOR) \\ &= \frac{(23{,}400)}{(17.5)} \times (30) \times (.65) \\ &= 26{,}000 \text{ weekly student-hours} \end{aligned}$$

Note that this alternate method yields a slightly greater WSH_c than the method illustrated in Step 4. This results from the existing ASF/N actually being 18.0 rather than the assumed value of 17.5.

Note also that this example makes no allowance for classrooms of such poor quality that they should be abandoned. Where such an adjustment is necessary it should be reflected in the facilities data in Step 1.

DISCUSSION

GENERAL PLANNING METHOD A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

- total number of classrooms required (R)
- total number of classroom stations (N)
- total classroom assignable square feet, including classroom service facilities (ASF).

PROGRAM DATA REQUIRED:

- projected total classroom weekly room-hours (WRH)
- projected total classroom weekly student-hours (WSH)

FACILITIES DATA REQUIRED:

- none

UTILIZATION ASSUMPTIONS REQUIRED:

- an average room-utilization rate (RUR)
- an average station-occupancy ratio (SOR)
- an average number of assignable square feet per classroom station, including classroom service facilities (ASF/N).

PROCEDURE:

1. Obtain the program data:

    - total projected classroom weekly room-hours (WRH), and
    - total projected classroom weekly student-hours (WSH).

   These numbers may be available either from the detailed program analysis procedures discussed in Manual Six, or from estimates. Estimates of weekly student-hours, for example, may be based upon an assumed average number of classroom hours per FTE student. If it is assumed that each FTE student will spend, on the average, 13 hours per week in classrooms, then, for a projected student body of 2400 FTE students there, will be 31,200 weekly student-hours (WSH) of classroom instruction.

$$\begin{aligned} \text{WSH} &= (\text{FTE students}) \times (\text{WSH per FTE student}) \\ &= (2400) \times (13) \\ &= 31{,}200 \text{ weekly student-hours} \end{aligned}$$

If it is further assumed that the average section size will be 20.8 students, then there will be 1500 weekly room-hours (WRH).

$$\begin{aligned} \text{WRH} &= \frac{(\text{WSH})}{(\text{Average Section Size})} \\ &= \frac{(31{,}200)}{20.8} \\ &= 1500 \text{ weekly room-hours} \end{aligned}$$

2. Establish as a matter of institutional policy:

   °an average room-utilization rate (RUR),

   °an average station-occupancy-ratio (SOR), and

   °an average number of assignable square feet per station, including classroom service facilities (ASF/N).

   For example, it might be assumed that, on the average, classrooms will be scheduled 30 hours per week, that, on the average, 65 percent of the seats will be occupied when the rooms are scheduled, and that, on the average, each station will require 18 assignable square feet.

   For a more complete discussion of the range of assignable square feet per station see Section 2.4.

3. Determine the required number of rooms (R).

   This is the mathematical quotient obtained by dividing the total projected weekly room-hours (WRH) by the assumed average room-utilization rate (RUR).

4. Determine the required number of stations (N).

   This is the mathematical quotient obtained by dividing the total projected weekly student-hours (WSH) by the assumed average station-utilization rate (SUR).

5. Determine the number of assignable square feet of classroom space required (ASF).

   This is the mathematical product of the number of stations (N) and the assumed number of assignable square feet per station including classroom service space (ASF/N).

COMMENT ON THE PROCEDURE:

See the introductory comments on General Planning Method A for the limitations of this procedure for projecting classroom requirements (Section 2.2).

EXAMPLE

GENERAL PLANNING METHOD A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

- total number of classrooms required (R),
- total number of classroom stations (N),
- total classroom assignable square feet, including classroom service facilities (ASF).

PROCEDURE:

1. Obtain the program data:
   - total projected classroom weekly room-hours (WRH), and
   - total projected classroom weekly student-hours (WSH).

     WRH = 1,500 weekly room-hours

     WSH = 31,200 weekly student-hours
2. Establish as a matter of institutional policy:
   - an average room-utilization rate = 30 hours per week
   - an average station-occupancy ratio = .65
   - an average number of assignable square feet per classroom station, including classroom service facilities = 18 assignable square feet per station

   therefore,

   - SUR = (30) x (.65)

     = 19.5 hours per week

3. Determine the required number of rooms (R):

R = (WRH)/(RUR)
= (1,500)/(30)
= 50 classrooms

4. Determine the required number of stations (N):

N = (WSH)/SUR)
= (31,200)/(19.5)
= 1,600 stations

The SUR in this example is derived from:

SUR = (RUR) x (SOR)
= (30) x (.65)
= 19.5 hours per week

5. Determine the number of assignable square feet of classroom space required (ASF):

ASF = (N) x (ASF/N)
= 1,600 x 18
= 28,800 assignable square feet

DISCUSSION

GENERAL PLANNING METHOD A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- additional number of classrooms required (R)
- additional number of classroom stations (N)
- additional classroom assignable square feet, including classroom service facilities (ASF).

PROGRAM DATA REQUIRED:

- projected total classroom weekly room-hours (WRH)
- projected total classroom weekly student-hours (WSH)

FACILITIES DATA REQUIRED:

- number of existing classrooms
- number of existing classroom stations
- number of assignable square feet in existing classrooms, including classroom service facilities (ASF/N).

UTILIZATION ASSUMPTIONS REQUIRED:

- an average room-utilization rate (RUR)
- an average station-occupancy ratio (SOR)
- an average number of assignable square feet per classroom station, including classroom service facilities.

PROCEDURE:

1. Obtain the program data:
    - total projected classroom weekly room-hours (WRH), and
    - total projected classroom weekly student-hours (WSH).

These numbers may be available either from the detailed program analysis procedures discussed in Manual Six, or from estimates. Estimates of weekly student-hours, for example, may be based upon an assumed average number of classroom hours per FTE student. If it is assumed that each FTE student will spend, on the average, 13 hours per week in classrooms, then, for a projected student body of 2400 FTE students there will be 31,200 weekly student-hours (WSH) of classroom instruction.

$$\begin{aligned} \text{WSH} &= (\text{FTE students}) \times (\text{WSH per FTE student}) \\ &= (2400) \times (13) \\ &= 31{,}200 \text{ weekly student-hours} \end{aligned}$$

If it is further assumed that the average section size ($\overline{\text{SS}}$) will be 20.8 students, then there will be 1500 weekly room-hours (WRH).

$$\begin{aligned} \text{WSH} &= \frac{(\text{Weekly Student-Hours})}{(\text{Average Section Size})} \\ &= \frac{(31{,}200)}{20.8} \\ &= 1500 \text{ weekly room-hours} \end{aligned}$$

2. Establish as a matter of institutional policy:

   - an average room-utilization rate (RUR),
   - an average station-occupancy-ratio (SOR), and
   - an average number of assignable square feet per station, including classroom service facilities (ASF/N).

   For example, it might be assumed that, on the average, classrooms will be scheduled 30 hours per week, that, on the average, 65 percent of the seats will be occupied when the rooms are scheduled, and that, on the average, each station will require 18 assignable square feet.

   For a more complete discussion of the range of assignable square feet per station see Section 2.4.

3. Determine the number of rooms required (R) for the projected year.

   This is the mathematical quotient obtained by dividing the total projected weekly room-hours (WRH) by the assumed average room-utilization rate (RUR).

4. Determine the number of additional rooms required (R) between the present and the projected year.

   This is the mathematical difference obtained by subtracting the existing number of rooms from the projected need.

5. Determine the number of stations required (N) for the projected year.

   This is the mathematical quotient obtained by dividing the total projected weekly student-hours (WSH) by the assumed station-utilization rate (SUR).

6. Determine the number of additional stations (N) required between the present and the projected year.

   This is the mathematical difference obtained by subtracting the existing number of stations from the projected need.

7. Determine the number of assignable square feet (ASF) of classroom space required for the projected year.

   This is the mathematical product of the number of stations (N) and the assumed number of assignable square feet per station, including classroom service space (ASF/N).

8. Determine the number of additional assignable square feet required (ASF) between the present and the projected year.

   This is the mathematical difference obtained by subtracting the existing number of assignable square feet from the projected need.

COMMENT ON THE PROCEDURE:

See the introductory comments on General Planning Method A for the limitations of this procedure in projecting additional classroom requirements (Section 2.2).

Note also that this procedure makes no assumption about the quality of existing classroom space. Classroom facilities judged to be of such poor quality that they should be abandoned ought to be subtracted from the existing facilities assumed in Steps 4, 6, and 8 of the PROCEDURE.

EXAMPLE

GENERAL PLANNING METHOD A

PROJECTION OF TOTAL CLASSROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- additional number of classrooms required (R),
- additional number of stations (N), and
- additional assignable square feet, including classroom service facilities (ASF).

PROCEDURE:

1. Obtain the program data:

   - total projected classroom weekly room-hours (WRH), and
   - total projected classroom weekly student-hours (WSH).

     WRH = 1,500 weekly room-hours

     WSH = 31,200 weekly student-hours

2. Establish as a matter of institutional policy:

   - an average room-utilization rate = 30 hours per week
   - an average station-occupancy ratio = .65
   - an average number of assignable square feet per classroom station, including classroom service facilities = 18 assignable square feet per station

   therefore,

   - SUR = (30) x (.65)

     = 19.5 hours per week

3. Determine the number of rooms required (R) for the projected year.

$$R = (WRH)/(RUR)$$

$$= (1{,}500)/(30)$$

$$= 50 \text{ classrooms}$$

4. Determine the number of additional rooms required (R) between the present and the projected year.

$$\text{Additional } R = (\text{Projected } R) - (\text{Existing } R)$$

$$= (50) - (40)$$

$$= 10 \text{ classrooms}$$

5. Determine the number of stations required (N) for the projected year.

$$N = (WSH)/(SUR)^*$$

$$= (31{,}200)/(19.5)$$

$$= 1{,}600 \text{ stations}$$

The SUR in this example is derived from:

$$SUR = (RUR) \times (SOR)$$

$$= (30) \times (.65)$$

$$= 19.5 \text{ hours per week}$$

6. Determine the number of additional stations required (N) between the present and the projected year.

$$\text{Additional } N = (\text{Projected } N) - (\text{Existing } N)$$

$$= (1{,}600) - (1{,}300)$$

$$= 300 \text{ stations}$$

7. Determine the number of assignable square feet (ASF) of classroom space required for the projected year.

$$ASF = (N) \times (ASF/N)$$

$$= (1{,}600) \times (18)$$

$$= 28{,}800 \text{ assignable square feet}$$

8. Determine the number of additional assignable square feet (ASF) required between the present and the projected year.

Additional ASF = (Projected ASF) - (Existing ASF) (ASF)

= (28,800) - (23,400)

= 5,400 assignable square feet

Note that this example makes no allowance for classrooms of such poor quality that they should be abandoned. Where such an adjustment is necessary it should be reflected in the existing facilities data in Steps 4, 6, and 8.

INTRODUCTORY COMMENTS

GENERAL PLANNING METHOD B

The general planning method described on succeeding pages can be very useful in certain limited applications. They can also be applied inappropriately and therefore may be very dangerous in the hands of the novice. These methods depend entirely on the validity of a single average number and yield only one rough-estimate answer. When the validity of the average can be demonstrated, then the resulting estimate has some utility as a rough estimate. Ultimately, however, the evaluation and projection of classroom requirements must take the form of the analysis outlined in the preceding DETAILED METHOD section.

General Planning Method B uses assignable square feet per FTE student as its only criterion. For the evaluation of existing space, Method B yields an estimate of the number of FTE students which can be accommodated in the existing classroom space; for projections of classroom space for a new institution, it provides only an estimate of the total assignable square feet required; for projecting of classroom space for an existing institution, it provides only the total additional assignable square feet required.

DISCUSSION

GENERAL PLANNING METHOD B

EVALUATION OF THE CAPACITY OF EXISTING CLASSROOM ASSIGNABLE SQUARE FEET

DATA TO BE DETERMINED:

- total number of FTE students which existing classrooms can accommodate.

PROGRAM DATA REQUIRED:

None

FACILITIES DATA REQUIRED:

- total* assignable square feet existing in classrooms (ASF).

UTILIZATION ASSUMPTIONS REQUIRED:

- average number of total* classroom assignable square feet required per FTE student.

PROCEDURE:

1. Obtain the total* assignable square feet (ASF) existing in classrooms.

2. Establish, on the basis of institutional practice and/or external criteria, the average number of total* classroom assignable square feet required per FTE student (ASF/FTE Su).

3. Determine the total number of FTE students which existing classrooms can accommodate.

   This is the mathematical quotient obtained by dividing the existing total classroom assignable square feet by the assumed average standard number of total classroom assignable square feet required per FTE student.

COMMENT ON THE PROCEDURE:

See the introductory comments on General Planning Method B for the limitations of this procedure in evaluating the capacity of existing classroom space.

Note also that this procedure makes no assumption about the quality of existing classroom space (See Section 2.3).

---

*"Total" implies the inclusion of classroom service facilities assignable square feet.

EXAMPLE

GENERAL PLANNING METHOD B

EVALUATION OF THE CAPACITY OF EXISTING CLASSROOM ASSIGNABLE SQUARE FEET

DATA TO BE DETERMINED:

- total number of FTE students which existing classrooms can accommodate.

PROCEDURE:

1. Obtain the total* assignable square feet (ASF) existing in classrooms, including classroom service facilities:

   Total* Classroom ASF = 23,400 assignable square feet

2. Establish, on the basis of institutional practice and/or external criteria, the average number of total* classroom assignable square feet (ASF) required per FTE student (FTE Sn):

   ASF/FTE Sn = 12 assignable square feet per FTE student

3. Determine the total number of FTE students which existing classrooms can accommodate:

   FTE Sn = (ASF)/(ASF/FTE Sn)
   = (23,400)/(12)
   = 1950 FTE students

   Note that this example makes no allowance for classroom assignable square feet of such poor quality that they should be abandoned. Where such an adjustment is necessary it should be reflected in the facilities data in Step 1.

---

*"Total" implies the inclusion of classroom service facilities assignable square feet.

DISCUSSION

GENERAL PLANNING METHOD B

PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

- total* assignable square feet of classroom space required (ASF)

PROGRAM DATA REQUIRED:

- projected total FTE students.

FACILITIES DATA REQUIRED:

none

UTILIZATION ASSUMPTIONS REQUIRED:

- average number of total* classroom assignable square feet required per FTE student.

PROCEDURE:

1. Obtain the projected total number of FTE students (FTE Sn).
2. Establish as an institutional goal, or on the basis of external criteria, the average number of total* classroom assignable square feet required per FTE student (ASF/FTE Sn).
3. Determine the total* assignable square feet of classroom space required (ASF).

   This is the mathematical product obtained by multiplying the projected total FTE students by the assumed average number of total* classroom assignable square feet required per FTE student.

COMMENT ON THE PROCEDURE:

See the introductory comments on General Planning Method B for the limitations of this procedure in projecting classroom assignable square feet (Section 2.3).

---

*"Total" implies the inclusion of classroom service facilities assignable square feet.

EXAMPLE
GENERAL PLANNING METHOD B
PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

•total* assignable square feet of classroom space required (ASF).

PROCEDURE:

1. Obtain the projected total number of FTE students (FTE Sn):

   FTE Sn = 2,400 FTE Students

2. Establish as an institutional goal, or on the basis of external criteria, the average number of total* classroom assignable square feet per FTE student (ASF/FTE Sn):

   Classroom ASF/FTE Sn = 12 assignable square feet per FTE student

3. Determine the total* assignable square feet of classroom space required (ASF):

   Classroom ASF = (FTE Sn) x (ASF/FTE Sn)
   = (2,400) x (12)
   = 28,800 assignable square feet

---

*"Total" implies the inclusion of classroom service facilities assignable square feet.

DISCUSSION

GENERAL PLANNING METHOD B

PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- additional total* assignable square feet of classroom space required (ASF)

PROGRAM DATA REQUIRED:

- projected total FTE students.

FACILITIES DATA REQUIRED:

- existing assignable square feet of classroom space, including classroom service facilities.

UTILIZATION ASSUMPTIONS REQUIRED:

- average number of total* classroom assignable square feet required per FTE student (ASF/FTE Su).

PROCEDURE:

1. Obtain the projected total number of FTE students (FTE Sn).

2. Establish as an institutional goal, or on the basis of external criteria, the average number of total classroom assignable square feet required per FTE student (ASF/FTE Sn).

3. Determine the total assignable square feet of classroom space required (ASF).

   This is the mathematical product obtained by multiplying the projected total FTE students by the assumed average number of total classroom assignable square feet required per FTE student.

4. Determine the number of additional total classroom square feet required (ASF) between the present and the projected year.

   This is the mathematical difference obtained by subtracting the existing number of assignable square feet from the projected need.

COMMENT ON THE PROCEDURE:

See the introductory comments on General Planning Method B for the limitations of this procedure in projecting additional classroom assignable square feet (Section 2.3).

Note also that this procedure makes no assumption about the quality of existing classroom space.

EXAMPLE

GENERAL PLANNING METHOD B

PROJECTION OF CLASSROOM ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- additional total* assignable square feet of classroom space required (ASF).

PROCEDURE:

1. Obtain the projected total number of FTE students (FTE Sn):

   FTE Sn = 2,400 FTE Students

2. Establish as an institutional goal, or on the basis of external criteria, the average number of total* classroom assignable square feet required per FTE student (ASF/FTE Sn):

   Classroom ASF/FTE Sn = 12 assignable square feet
   per FTE student

3. Determine the total* assignable square feet of classroom space required (ASF):

   Classroom ASF = (FTE Sn) x (ASF/FTE Sn)
   = (2,400) x (12)
   = 28,800 assignable square feet

4. Determine the number of additional total* classroom assignable square feet required (ASF) between the present and the projected year:

   Additional ASF = Projected ASF - Existing ASF
   = (28,800) - (23,400)
   = 5,400 assignable square feet

   Note that this example makes no allowance for classroom assignable square feet of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the existing ASF data in Step 4.

---

*"Total" implies the inclusion of classroom service facilities assignable square feet.

CLASS ROOM UTILIZATION AND UNIT FLOOR AREA CRITERIA

ROOM TYPE: Classroom Facilities

ROOM TYPE CODE: 110 Classroom
115 Classroom Service

UTILIZATION CRITERIA:

Two measures of utilization have been assumed in the evaluation and the projection of classroom requirements: a room-utilization rate and a station-occupancy ratio. It is important to recognize that these are not independent measures. Frequently, an increase in the room-utilization rate occurs at the expense of the station-occupancy ratio. Consider, for example, a one-station course of 30 students meeting in a room with 30 stations. If one more student enrolls in that course and it is divided into two sections of 15 and 16 students, then the room-utilization rate is doubled but the station-occupancy ratio is cut nearly in half.

In general, a relatively lower room-utilization rate may be appropriate for the classrooms with the largest station counts. No generalization concerning room-utilization rates in the smallest classrooms seems to be warranted.

In general, the station-occupancy ratio is most likely to reach its maximum value for rooms whose station count most nearly corresponds to the average section size. In most instances, the station-occupancy ratio can be expected to decrease as the station count becomes relatively larger or smaller than the average section size.

Although, no absolute numbers can be recommended for any group of institutions, typical ranges of assumed room-utilization rates might be from 20 to 32 hours per week, and assumed station-occupancy ratios from 0.45 to 0.85.

UNIT FLOOR AREA CRITERIA:

Tabulated by:

- Number of stations per room
- Type of station

Classroom furniture varies considerably in its design and dimensions. In planning new facilities or in the replacement of furniture in existing facilities, it is important to choose first the kind of classroom furniture required and then make dimensioned lay-outs of actual furniture arrangements in the classroom.

As generalized planning guides, the following ranges of classroom unit floor area criteria may be useful. It should be noted that different seating configurations and the amount of circulation space within the classroom affect these unit area allowances.

TABLE 2.19

RANGES OF CLASSROOM UNIT FLOOR AREA CRITERIA
OF STATION COUNT AND TYPE OF STATION

STATION COUNT	ASSIGNABLE SQUARE FEET PER STATION				
	TABLES & CHAIRS	TABLET-ARM CHAIRS		AUDITORIUM SEATING	
		SMALL	LARGE	THEATRE	CONTINENTAL
5-9	20-30	20	30	--	--
10-19	20-30	18	22	--	--
20-29	20-30	16	20	--	--
30-39	20-25	15	18	--	--
40-49	18-22	14	16	--	--
50-59	18-22	14	16	--	--
60-99	18-22	13	15	10-14	18-22
100-149	16-20	11	14	9-12	16-20
150-299	16-20	10	14	8-10	14-18
300+	16-18	9	12	7-10	14-18

CLASS LABORATORY

ROOM TYPES INCLUDED:

Class laboratories, teaching laboratories, instructional shops, and similar rooms which are used for regularly-scheduled group instruction in a particular academic specialty.[1] Related service rooms are also included.

DISCUSSION:

Because a class laboratory typically is designed for a particular academic program or a specialty within an academic program, it usually is assigned to the control of a department or similar organizational unit. Unlike a classroom, it is not considered to be an institution-wide resource.

Because a class laboratory can serve more than one group of students, it usually is scheduled on a formal basis.

Three methods of evaluating or projecting class laboratory requirements are discussed here:

- a detailed method designed to evaluate or project the:
  - number of class laboratories
  - number of stations (station-count) in each class laboratory
  - assignable square feet in each class laboratory
  - assignable square feet of class laboratory service facilities
- a general planning method designed to evaluate or project, for each academic unit, the
  - total number of class laboratories,
  - total stations, and
  - total assignable square feet.

---

[1] The term "academic specialty" is used here to mean a reasonably specific academic offering such as organic chemistry, the term "academic unit" specifies an organizational unit such as the chemistry department, and "academic program" designates broad area of study such as the physical sciences.

- a second general planning method designed to evaluate or project only total assignable square feet of class laboratory facilities.

In the Detailed Method the class laboratory requirements usually are projected by academic specialty or academic unit. Utilization criteria may be developed for academic specialties (e.g., organic chemistry), for typical academic units (e.g., chemistry), or for broad academic programs (e.g., physical sciences).

In General Planning Method A, which is designed to evaluate or project total number of rooms, stations, and assignable square feet, these class laboratory requirements usually are projected by academic unit, although occasionally, only total institutional requirements are determined. As in the detailed method, utilization criteria may be developed for academic specialties, for typical departments, or for broad academic programs.

In General Planning Method B, which is designed to evaluate or project only total assignable square feet, usually only total institutional requirements are evaluated or projected.

The application of each of these three methods is illustrated under three conditions:

- evaluation of existing class laboratory capacities
- projection of future class laboratory requirements for
    - a new institution
    - an existing institution.

INTRODUCTORY COMMENTS

DETAILED METHOD

The detailed method described and illustrated on the following pages respresents a procedure recommended for use when the evaluation and projection of class laboratory requirements must be determined as explicitly as possible.

Very detailed data are assumed. In some instances, institutions may need to modify the procedure because data of the required level of detail are not available. The procedure is designed to permit such modification; however, it must be recognized that the validity of the results may be affected when less specific data are used.

Both the evaluation and the projection of class laboratory facilities require two utilization assumptions: a room-utilization rate and a station-occupancy ratio. It is a fundamental thesis of this procedure that utilization criteria specific to each class laboratory (or at least to all class laboratories within an academic speciality) should be used rather than averages applied to all class laboratories. In most institutions there is ample justification for less intensive scheduled use of the class laboratories in certain academic specialties (or units) than in others. In general the variation in instructional methodologies among academic specialties may be expected to affect the assumed room-utilization rate more than the assumed station-occupancy ratio. The assumed station-occupancy ratio is more likely to be affected by course level. In general, the assumed station-occupancy ratio may be expected to be relatively larger in lower-level, multi-sectioned laboratory courses but relatively smaller in upper-level, small-numbers-of-sections laboratory courses.

In addition to these utilization assumptions, the evaluation of existing class laboratory capacity requires a detailed inventory of existing class laboratory facilities. On the basis of the utilization assumptions and inventory data of existing class laboratory facilities, it yields estimates of the number of weekly room-hours and weekly student-hours which existing class laboratories in each academic specialty can accommodate. It should be noted that this procedure differs from the typical class laboratory utilization study. It is designed to answer not how well (or poorly) existing class laboratories are being used but rather what the capacity of existing class laboratories is to accommodate an educational program.

The projection of class laboratory requirements for a new institution requires, in addition to the utilization assumptions described above, detailed distributions of class laboratory weekly room-hours and weekly student-hours for each academic specialty. (The methodology for determining these data is discussed in Manual Six.) From these program data and utilization assumptions it is possible to project the required number of class laboratories for each academic specialty. That result, combined with an evaluation of the type of class laboratory equipment and consequent assignable square feet per station, permits the specific designation of the class laboratory requirements which results from a proposed academic program.

The projection of class laboratory requirements for an existing institution is similar to that of a new institution. However, it requires, in addition, data concerning existing class laboratory facilities. The procedure results in the specification of the required number of additional class laboratories for each academic specialty and the assignable square feet in each.

DISCUSSION
DETAILED METHOD
EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

DATA TO BE DETERMINED:

For each academic specialty, the number of:

- weekly room-hours (WRH), and
- weekly student-hours (WSH).

which existing class laboratories can accommodate.

PROGRAM DATA REQUIRED:

None. (For a discussion of the application of current program data to the utilization of class laboratories, see Manual Six.)

FACILITIES DATA REQUIRED:

For each academic specialty:

- number of existing class laboratories (R)

and for each class laboratory

- the number of stations (station-count = N/R), and
- the assignable square feet (ASF)

and for class laboratory service facilities:

- the assignable square feet (ASF).

UTILIZATION ASSUMPTIONS REQUIRED:

For each class laboratory:

- a room-utilization rate (RUR), and
- a station-occupancy ratio (SOR).

PROCEDURE:

1. For each academic specialty, obtain from the facilities inventory:

   - the number of existing class laboratories (R)

   and for each existing class laboratory

   - the number of stations (station-count = N/R), and
   - the assignable square feet (ASF)

   and for class laboratory service facilities

   - the assignable square feet (ASF).

   These data are illustrated on Table 3.1.

2. For each academic specialty, establish as a matter of institutional policy:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

   These utilization criteria may be average values applicable to all academic specialties within an academic program, or specific values for each specialty. Sufficient variation exists among academic specialties in the non-scheduled use of class laboratories such that a single utilization standard should not be adopted for all of them. Specific values ought to be applied to each academic specialty. In certain instances it may even be desirable to develop utilization criteria for specific class laboratories within an academic specialty.

   These utilization criteria are illustrated on Table 3.2.

3. For each academic specialty, determine the number of weekly room-hours which can be accommodated in existing class laboratories, (WRH_c).

   This weekly room-hour capacity (WRH_C) is the mathematical product of the number of rooms (R) of each capacity and the room-utilization rate (RUR), for each laboratory (or academic grouping of laboratories):

   Weekly Room-Hour Capacity = (Number of Rooms) x (Room-Utilization Rate)

$$WRH_c = (R) \times (RUR)$$

For example, if it is assumed that 4 first-year biology A laboratories can be scheduled for use 22 hours per week and 2 advanced, biology C laboratories can be scheduled only 20 hours, then

$$\text{Biology A } WRH_c = (4) \times (22)$$

$$= 88 \text{ Weekly Room-hours}$$

$$\text{Biology C } WRH_c = (2) \times (20)$$

$$= 40 \text{ Weekly Room-hours}$$

4. For each academic specialty, determine the number of weekly student-hours (WSH_c) which can be accommodated in existing class laboratories.

This weekly student-hour capacity (WSH_c) is the mathematical product of the number of stations (N) and the station-utilization rate (SUR) for each laboratory (or academic grouping of laboratories):

Weekly Student-Hour Capacity = (Number of Stations) x (Station-Utilization Rate)

$$WSH_c = (N) \times (SUR)$$

For example, if it is assumed that 4 first-year biology A laboratories, each with 25 stations, can be scheduled 22 hours per week (room-utilization rate) and that .80 of the stations will be occupied when the room is scheduled (station-occupancy ratio), and that 2 advanced biology C laboratories, with 20 stations, can be scheduled 20 hours per week with a .60 station-occupancy ratio, then

$$\text{Biology A } WSH_c = (4 \times 25) \times (22 \times .80)^*$$

$$= 1{,}760 \text{ Weekly Student-hours}$$

$$\text{Biology C } WSH_c = (2 \times 20) \times (20 \times .60)^*$$

$^*WSH_c = N \times SUR = (R \times N/R) \times (RUR \times SOR)$

COMMENT ON THE PROCEDURE:

The procedure outlined above makes no assumption about the quality of the existing class laboratory space. If some existing class laboratory space is of such poor quality that it will no longer be used, then that adjustment should be reflected in Step 1 of the Procedure. For each academic specialty, the numbers of rooms, numbers of stations, and the assignable square feet of class laboratory and class laboratory service space should be reduced by the numbers and amounts which will no longer be used. Note that the procedure does allow for the limited use of certain rooms by permitting specific room and/or station utilization rates to be applied to specific class laboratories.

EXAMPLE
DETAILED METHOD
EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

DATA TO BE DETERMINED:

For each academic specialty, the number of:

- weekly room-hours (WRH), and
- weekly student-hours (WSH)

which existing class laboratories can accommodate.

PROCEDURE:

1. For each academic specialty, obtain from the facilities inventory:
    - the number of existing class laboratories (R)

    and for each existing class laboratory
    - the number of stations (station-count = N/R), and
    - the assignable square feet (ASF)

    and for class laboratory service facilities
    - the assignable square feet (ASF).

TABLE 3.1

EXISTING CLASS LABORATORIES BY STATION COUNT AND ASSIGNABLE SQUARE FEET FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	TYPE OF ROOM	NUMBER OF ROOMS	STATION COUNT*	ASSIGNABLE SQUARE FEET EACH ROOM	TOTAL STATIONS	TOTAL ASSIGNABLE SQUARE FEET
		R	N/R*	ASF/R	N	ASF
Biology A	Lab	4	25	900	100	3,600
Biology C	Lab	2	20	1,000	40	2,000
Biology	Service	-	--	-----	--	1,120
Zoology A	Lab	1	35	1,050	35	1,050
Zoology B	Lab	1	25	1,050	25	1,050
Zoology	Service	-	--	-----	--	780
Chemistry A	Lab	2	30	1,080	60	2,160
Chemistry B	Lab	2	20	800	40	1,600
Chemistry C	Lab	2	20	1,040	40	2,080
Chemistry	Service	-	--	-----	--	3,280
Geology A	Lab	1	30	1,080	30	1,080
Geology B	Lab	1	30	1,320	30	1,320
Geology	Service	-	--	-----	--	480
Physics A	Lab	2	30	1,200	60	2,400
Physics B	Lab	1	25	1,200	25	1,200
Physics C	Lab	1	15	900	15	900
Physics	Service	-	--	-----	--	2,700

*Number of stations per room

2. For each academic specialty, establish as a matter of institutional policy:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

TABLE 3.2

ASSUMED ROOM-UTILIZATION RATES, STATION-OCCUPANCY RATIOS AND STATION-UTILIZATION RATES FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	ASSUMED ROOM-UTILIZATION RATE	ASSUMED STATION-OCCUPANCY RATIO	ASSUMED STATION-UTILIZATION RATE
	RUR	SOR	SUR*
Biology A	22	.80	17.6
Biology C	20	.60	12.0
Zoology A	20	.80	16.0
Zoology B	20	.80	16.0
Chemistry A	20	.85	17.0
Chemistry B	20	.60	12.0
Chemistry C	20	.60	12.0
Geology A	25	.64	16.0
Geology B	25	.64	16.0
Physics A	25	.80	20.0
Physics B	21	.80	16.8
Physics C	20	.60	12.0

*SUR = RUR x SOR

NOTE: The utlization rates displayed in Table 3.2 are illustrative only and are not recommended as standards.

3. For each academic specialty, determine the number of weekly room-hours which can be accommodated in existing class laboratories, (WRH_c).

TABLE 3.3

WEEKLY ROOM-HOUR CAPACITY OF CLASS LABORATORIES IN EACH ACADEMIC SPECIALITY

ACADEMIC SPECIALTY	NUMBER OF ROOMS	ROOM-UTILIZATION RATE	WEEKLY-ROOM HOUR CAPACITY (WRH_c)
	R	RUR	(R) x (RUR)
Biology A	4	22	88
Biology C	2	20	40
Zoology A	1	20	20
Zoology B	1	20	20
Chemistry A	2	20	40
Chemistry B	2	20	40
Chemistry C	2	20	40
Geology A	1	25	50
Geology B	1	25	50
Physics A	2	25	50
Physics B	1	21	21
Physics C	1	20	20

Note that in this example the name RUR is applicable to all class laboratories within an academic specialty. While this is the typical assumption used, it is nevertheless possible, and in some instances may be appropriate, to apply different RUR criteria to each class laboratory within an academic specialty.

4. For each academic specialty, determine the number of weekly student-hours which can be accommodated in existing class laboratories (WSH_c).

TABLE 3.4
WEEKLY STUDENT-HOUR CAPACITY OF CLASS LABORATORIES IN EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALITY	TOTAL STATIONS	ASSUMED STATION-UTILIZATION RATE	WEEKLY STUDENT-HOUR CAPACITY (WSH_c)
	N	SUR	(N) x (SUR)
Biology A	100	17.6	1,760
Biology C	40	12.0	480
Zoology A	35	16.0	560
Zoology B	25	16.0	400
Chemistry A	60	17.0	1,020
Chemistry B	40	12.0	480
Chemistry C	40	12.0	480
Geology A	30	16.0	480
Geology B	30	16.0	480
Physics A	60	20.0	1,200
Physics B	25	16.8	420
Physics C	15	12.0	180

Note that this example makes no allowance for class laboratory facilities of such poor quality that they should be abandoned. Where such an adjustment is necessary it should be reflected in the existing facilities data of Steps 1, 3, and 4.

DISCUSSION

DETAILED METHOD

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

For each academic specialty, the:

- number of class laboratories (R)

and for each class laboratory

- the number of stations (station count = N/R) and
- the assignable square feet (ASF)

and for class laboratory service facilities

- the assignable square feet (ASF)

PROGRAM DATA REQUIRED:

- A distribution of projected class laboratory weekly room-hours (WRH) by size of section for each academic specialty

which implies

- a distribution of projected class laboratory weekly student-hours (WSH) by size of section for each academic specialty.

These distribution are derived from:

- projected course enrollments for each academic specialty

distributed by

- size of class laboratory section, and
- number of class laboratory hours of instruction required per section.

FACILITIES DATA REQUIRED:

None

UTILIZATION ASSUMPTIONS REQUIRED:

For each class laboratory:

- a room-utilization rate (RUR),
- a station-occupancy ratio (SOR), and
- the number of assignable square feet per station (ASF/N).

PROCEDURE:

1. For each academic specialty, obtain from the program analysis procedure (discussed in Manual Six) these distributions:

    - weekly room-hours (WRH) by size of section (SS), and
    - weekly student-hours (WSH) by size of section (SS).

    These data are illustrated on Table 3.5.

2. For each academic specialty, establish as a matter of institutional policy:

    - a room-utilization rate (RUR), and
    - a station-occupancy ratio (SOR).

    These utilization criteria may be average values applicable to all specialties within an academic program, or specific values for each specialty. Sufficient variation exists among specialties in the non-scheduled use of class laboratories that a single utilization standard should not be adopted for all of them. Specific values ought to be applied to each academic specialty. In certain instances it may even be desirable to develop utilization criteria for specific class laboratories within an academic specialty.

    These utilization criteria are illustrated on Table 3.6.

3A. For each academic specialty, determine the number of stations (N) required to accommodate the projected weekly student-hours (WSH). (Method A)

This is the mathematical quotient derived by dividing the projected weekly student-hours (WSH) by the assumed station-utilization rate (SUR).

Number of Stations = (Weekly Student-Hours)/(Station-Utilization Rate)

N = (WSH)/(SUR)

3B. For each academic specialty, determine the number of stations required to accommodate the projected average section size ($\overline{SS}$). (Method B).

The number of stations may be determined on another basis. It is usually the case that the capacity for a class laboratory (or a group of similar ones) is set on the basis of an instructional decision concerning the maximum laboratory section size. Hence, the number of stations may be determined by use of the projected average section size and the station-occupancy ratio rather than by use of the WSH/SUR ratio:

Number of stations per room = (Projected Average Section Size)/(Assumed Station-Occupancy Ratio)

N/R = ($\overline{SS}$)/(SOR)

and

Number of Stations = (Number of Stations per Room) x (Number of Rooms)

N = (N/R) x (R)

Although this alternate method (Method B) can be shown to be mathematically equivalent to the WSH/SUR Method (Method A), it may produce numerically different results because of the sequence of the calculations. For a more complete discussion of the two methods see CLASS LABORATORY ESSAY (Section 3.6 of this Manual).

4. For each academic specialty, determine the required number of rooms (R).

This is the mathematical quotient derived by dividing the projected weekly room-hours (WRH) by the assumed room-utilization rate (RUR).

Number of Rooms = (Weekly Room-Hours)/(Room-Utilization Rate)

R = (WRH)/(RUR)

See the COMMENT section following Step 5.

5. For each academic specialty, decide the final projected number of rooms of each station count (number of stations per room = N/R) and determine the design criteria and calculate the required laboratory assignable square feet. For all class laboratory space in an academic unit (e.g., all biology specialties), determine the laboratory service assignable square feet.

   These calculations may be made on two bases, as illustrated in the example which follows. The two methods reflect the alternate ways of calculating student-station requirements.

   Note that an alternative method sometimes used to project the assignable square feet of class laboratory space including related service space is the use of a single assignable-square-feet-per station value which provides sufficient space for both laboratory space and the related service space.

COMMENT ON THE PROCEDURE:

The number of stations in each class laboratory may be determined by either of two procedures. Most commonly it is derived from an academic decision concerning the maximum laboratory section size appropriate to each academic speciality. In this case the number of stations in each class laboratory is derived by dividing the average section size ($\overline{SS}$) by the assumed station-occupancy ratio (SOR). Alternatively, the total number of stations required by an academic specialty can be calculated by dividing total weekly student-hours (WSH) by the assumed station-utilization rate (SUR). Both methods involve an assumed station-occupancy ratio (SOR). In one instance the station-occupancy ratio is used directly; in the other instance, it is involved as a function of the station-utilization rate, because SUR = (RUR) x (SOR).

In determining the station-occupancy ratio (SOR) for each class laboratory (or for all the class laboratories of an academic specialty) three objectives must be kept in mind:

- Room-utilization standards require that each room be used to the fullest extent possible. A particular class laboratory must accommodate not only sections equal in size to the number of stations but also sections of lesser numbers. Not until an optimum level of room-utilization is reached does the level of station-utilization become important.

- Differences among and within academic specialties, units, and programs suggest that different station-occupancy ratios be applied to various laboratories. Some academic specialties, for example, enroll relatively few students. The distribution of those few students among several sections may result in section sizes considerably smaller than the number of stations in the laboratory and consequently low station-occupancy ratios. Conversely within a specialty, the class laboratories for courses with the larger enrollments may be expected to have the higher station-occupancy ratios.

- Scheduling principles require that some excess seating capacity be available. Single-section laboratory courses, or even those with limited numbers of sections, make it difficult for a student to develop a conflict-free schedule. The provision of sufficient sections to reduce scheduling conflicts may lower section-sizes and consequently the station-occupancy ratio.

The required number of class laboratories is determined by applying the assumed (standard) room-utilization rate to the projected weekly room-hours for each academic specialty. Because it is assumed generally that a single maximum station-count will apply to all laboratories within a particular specialty, there may not be a range of class laboratory station-counts as there is in the case of classrooms. (Typically, when additional class laboratories are required, they are designed with the same station-count. The decision to build additional class laboratories results from a determination that both the room-utilization rate and the station-occupancy ratio have reached their optimum levels.)

In determining class laboratory room-utilization rates, one major consideration must be kept in mind. Differences among and within academic programs suggest that different room-utilization rates are appropriate for various class laboratories. The primary determinant in setting a level of room-use is the amount of non-scheduled or informal use typical of the discipline. An introductory geology course, for instance, may involve no "extra-class" use of the laboratory. An architecture course may require much more non-scheduled use of the laboratory than is required for formal course instruction. Because the assumed (standard) room-utilization rate is based only on the regularly scheduled use of the class laboratory, the room-utilization rate can be relatively higher in the case of limited non-scheduled use and should be relatively lower when considerable non-scheduled use is typical.

The assignable square feet for each class laboratory is a design problem based on the kind and extent of laboratory equipment as well as the internal circulation space. Wide variations exist among the various academic programs. For example, a station in a biology laboratory requires much less space than a station in an automotive engineering laboratory. Within academic units, differences may also occur. For example, a station in introductory chemistry typically requires somewhat less space than a station for organic chemistry.

In the development of assignable-square-feet-per-station standards for class laboratories, it is a generally accepted practice to include the related class laboratory service space. For example, a value of assignable square feet per station in general chemistry includes not only the class laboratory facilities, but also the related balance room(s), stock room(s), and so on.

In the example which follows, it is assumed that laboratory service space serves all of the class laboratories of a particular group of academic specialties. For example, it is assumed that the laboratory service space for chemistry serves all academic specialties in chemistry.

EXAMPLE

DETAILED METHOD

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

For each academic specialty, the:

- number of class laboratories (R)

and for each class laboratory

- the number of stations (station count = N/R), and
- the assignable square feet (ASF)

and for class laboratory service facilities

- the assignable square feet (ASF).

PROCEDURE:

1. For each academic specialty, obtain from the program analysis procedure (discussed in Manual Six) these distributions:
    - weekly room-hours (WRH) by size of section (SS), and
    - weekly student-hours (WSH) by size of section (SS).

TABLE 3.5

PROJECTED WEEKLY ROOM-HOURS (WRH) AND WEEKLY STUDENT-HOURS (WSH) BY SIZE OF SECTION (SS) FOR EACH ACADEMIC SPECIALTY

BIOLOGY

SPECIALTY A			SPECIALTY B			SPECIALTY C		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
25	8	200	20	4	80	20	4	80
24	8	196	19	8	152	16	4	64
23	16	368	17	4	68	13	4	52
22	16	352	16	4	64	12	8	96
21	16	336	15	4	60	11	4	44
20	8	160	14	8	112	10	8	80
19	8	152	13	8	104	8	8	64
TOTAL	80	1,760	TOTAL	40	640	TOTAL	40	480

ZOOLOGY

SPECIALTY A			SPECIALTY B		
SS	WRH	WSH	SS	WRH	WSH
32	4	128	23	4	92
29	4	116	20	8	160
27	4	108	19	4	76
26	8	208	18	4	72
TOTAL	20	560	TOTAL	20	400

TABLE 3.5 (continued)

CHEMISTRY

SPECIALTY A			SPECIALTY B			SPECIALTY C		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
30	4	120	19	4	76	17	8	136
29	8	232	17	4	68	16	8	128
27	8	216	15	8	120	15	8	120
26	16	416	14	8	112	13	4	52
25	16	400	13	8	104	11	4	44
24	16	384	TOTAL	32	480	TOTAL	32	480
23	8	184						
22	4	88						
TOTAL	80	2,040						

GEOLOGY

SPECIALTY A			SPECIALTY B		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH
24	4	96	22	8	176
21	4	84	21	4	84
29	4	80	20	4	80
19	4	76	19	4	76
18	8	144	16	4	64
TOTAL	24	480	TOTAL	24	480

TABLE 3.5 (Conclusion)

PHYSICS

SPECIALTY A			SPECIALTY B			SPECIALTY C		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
28	5	140	24	5	120	14	3	42
27	5	135	21	5	105	12	3	36
26	5	130	20	5	100	9	6	54
24	10	240	19	5	95	8	6	48
23	10	230	TOTAL	20	420	TOTAL	18	180
22	10	220						
21	5	105						
TOTAL	50	1,200						

2. For each academic specialty, establish as a matter of institutional policy:

   - a room-utilization rate (RUR), and
   - a station-occupancy ratio (SOR).

TABLE 3.6

ASSUMED ROOM-UTILIZATION RATES (RUR), STATION-OCCUPANCY RATIOS (SOR), AND STATION-UTILIZATION RATES (SUR), FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	ASSUMED ROOM-UTILIZATION RATE	ASSUMED STATION-OCCUPANCY RATIO	ASSUMED STATION-UTILIZATION RATE
	RUR	SOR	SUR*
Biology A	22	.80	17.6
Biology B	20	.80	16.0
Biology C	20	.60	12.0
Zoology A	20	.80	16.0
Zoology B	20	.80	16.0
Chemistry A	20	.85	17.0
Chemistry B	20	.60	12.0
Chemistry C	20	.60	12.0
Geology A	25	.64	16.0
Geology B	25	.64	16.0
Physics A	25	.80	20.0
Physics B	21	.80	16.8
Physics C	20	.60	12.0

*SUR = (RUR) x (SOR)

NOTE: The utilization rates displayed in Table 3.6 are illustrative only and are not recommended as standards.

3A. For each academic specialty, determine the number of stations (N) required to accommodate the projected weekly student-hours (WSH). (Method A)

TABLE 3.7A

WEEKLY STUDENT-HOURS (WSH), STATION-UTILIZATION RATES (SUR), AND NUMBER OF STATIONS REQUIRED (N), FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	WEEKLY STUDENT-HOURS WSH	STATION-UTILIZATION RATE SUR	NUMBER OF STATIONS N = (WSH)/(SUR)
Biology A	1,760	17.6	100
Biology B	640	16.0	40
Biology C	480	12.0	40
Zoology A	560	16.0	35
Zoology B	400	16.0	25
Chemistry A	2,040	17.0	120
Chemistry B	480	12.0	40
Chemistry C	480	12.0	40
Geology A	480	16.0	30
Geology B	480	16.0	30
Physics A	1,200	20.0	60
Physics B	420	16.8	25
Physics C	180	12.0	15

3B. For each academic specialty, determine the number of stations required to accommodate the projected average section size ($\overline{SS}$). (Method B)

TABLE 3.7B

WEEKLY ROOM-HOURS (WRH), WEEKLY STUDENT-HOURS (WSH), AVERAGE STATION SIZE ($\overline{SS}$), ASSUMED STATION-OCCUPANCY RATES (SOR) AND NUMBER OF STATIONS PER ROOM (N/R) FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	Weekly Room Hours	Weekly Student Hours	Average Section Size	Station-Occupancy Rates	Number of Stations Per Room
	WRH	WSH	$\overline{SS}$ = WSH/WRH	SOR	*N/R = $\overline{SS}$/SOR
Biology A	80	1,760	22	.80	27.50
Biology B	40	640	16	.80	20.00
Biology C	40	480	12	.60	20.00
Zoology A	20	560	28	.80	35.00
Zoology B	20	400	20	.80	25.00
Chemistry A	80	2,040	25.5	.85	30.00
Chemistry B	32	480	15	.60	25.00
Chemistry C	32	480	15	.60	25.00
Geology A	24	480	20	.64	31.25
Geology B	24	480	20	.64	31.25
Physics A	50	1,200	24	.80	30.00
Physics B	20	420	21	.80	26.25
Physics C	18	180	10	.60	16.67

*N/R = Station-Count

4. For each academic specialty, determine the required number of rooms (R).

TABLE 3.8

WEEKLY ROOM-HOURS (WRH), ASSUMED ROOM-UTILIZATION RATES (RUR), FRACTIONAL NUMBER OF ROOMS (R_F), AND NUMBER OF ROOMS REQUIRED (R) FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	WEEKLY ROOM-HOURS	ASSUMED ROOM-UTILIZATION RATE	FRACTIONAL NUMBER OF ROOMS	NUMBER OF ROOMS
	WRH	RUR	R_F = WRH/RUR	R
Biology A	80	22	3.64	4
Biology B	40	20	2.00	2
Biology C	40	20	2.00	2
Zoology A	20	20	1.00	1
Zoology B	20	20	1.00	1
Chemistry A	80	20	4.00	4
Chemistry B	32	20	1.60	2
Chemistry C	32	20	1.60	2
Geology A	24	25	.96	1
Geology B	24	25	.96	1
Physics A	50	25	2.00	2
Physics B	20	21	0.95	1
Physics C	18	20	0.90	1

5. For each academic specialty, decide the final projected number of rooms of each station count (number of stations per room = N/R), determine the design criteria, and calculate the required laboratory assignable square feet per room (LASF/R).

TABLE 3.9

NUMBER OF ROOMS (R), NUMBER OF STATIONS (N), NUMBER OF STATIONS PER ROOM (N/R), LABORATORY ASSIGNABLE SQUARE FEET PER STATION (LASF/N), LABORATORY ASSIGNABLE-SQUARE-FEET-PER-ROOM (LASF/R), LABORATORY ASSIGNABLE SQUARE FEET (LASF), LABORATORY SERVICE ASSIGNABLE-SQUARE-FEET-PER-STATION (LsASF/N), LABORATORY SERVICE ASSIGNABLE SQUARE FEET (LsASF), AND TOTAL ASSIGNABLE SQUARE FEET (ASF) BY ACADEMIC DISCIPLINE AND BY METHOD OF CALCULATING STATIONS

METHOD A	BIOLOGY SPECIALTIES			
	A	B	C	TOTAL
R	4	2	2	8
N	100	40	40	180
N/R	25	20	20	22.5
LASF/N	36	40	50	40
LASF/R = N/R x LASF/N	900	800	1,000	900
LASF = LASF/R x R	3,600	1,600	2,000	7,200
LsASF/N	---	---	---	8
LsASF = LsASF/N x N	---	---	---	1,440
ASF=LASF + LsASF	---	---	---	8,640
METHOD B				
R	4	2	2	8
N	110	40	40	190
N/R	27.5	20.0	20.0	23.75
LASF/N	36	40	50	41+
LASF/R = N/R x LASF/N	1,050	800	1,000	975
LASF = LASF/R x R	4,200	1,600	2,000	7,800
LsASF/N	---	---	---	8
LsASF = LsASF/N x N	---	---	---	1,520
ASF = LASF + LsASF	---	---	---	9,320

TABLE 3.9 (Continued)

METHOD A = B	ZOOLOGY SPECIALTIES		
	A	B	TOTAL
R	1	1	2
N	35	25	60
N/R	35	25	30
LASF/N	30	42	35
LASF/R = N/R x LASF/N	1,050	1,050	1,050
LASF = LASF/R x R	1,050	1,050	2,100
LsASF/N	---	---	13
LsASF = LsASF/N x N	---	---	780
ASF = LASF + LsASF	---	---	2,880

METHOD A	CHEMISTRY SPECIALTIES			
	A	B	C	TOTAL
R	4	2	2	8
N	120	40	40	200
N/R	30	20	20	25
LASF/N	36	40	52	40
LASF/R = N/R x LASF/N	1,080	800	1,040	1,000
LASF = LASF/R x R	4,320	1,600	2,080	8,000
LsASF/N	---	---	---	20
LsASF = LsASF/N x N	---	---	---	4,000
ASF = LASF + LsASF	---	---	---	12,000
METHOD B				
R	4	2	2	8
N	120	50	50	220
N/R	30	25	25	27.50
LASF/N	36	40	52	40.5+
LASF/R = N/R x LASF/N	1,080	1,000	1,300	1,115
LASF = LASF/R x R	4,320	2,000	2,600	8,920
LsASF/N	---	---	---	20
LsASF = LsASF/N x N	---	---	---	4,400
ASF = LASF + LsASF	---	---	---	13,320

TABLE 3.9 (Continued)

METHOD A	GEOLOGY SPECIALTIES		
	A	B	TOTAL
R	1	1	2
N	30	30	60
N/R	30	30	30
LASF/N	36	44	40
LASF/R = N/R x LASF/N	1,080	1,320	1,200
LASF = LASF/R x R	1,080	1,320	2,400
LsASF/N	---	---	8
LsASF = LsASF/N x N	---	---	480
ASF = LASF + LsASF	---	---	2,880
METHOD B			
R	1	1	2
N	32	32	64
N/R	31.25	31.25	32
LASF/N	36	44	39+
LASF/R = N/R x LASF/N	1,125	1,375	1,250
LASF = LASF/R x R	1,125	1,375	2,500
LsASF/N	---	---	8
LsASF = LsASF/N x N	---	---	512
ASF = LASF + LsASF	---	---	3,012

METHOD A	PHYSICS SPECIALTIES			
	A	B	C	TOTAL
R	2	1	1	4
N	60	25	15	100
N/R	30	25	15	25
LASF/N	40	48	60	45
LASF/R = N/R x LASF/N	1,200	1,200	900	1,125
LASF = LASF/R x R	2,400	1,200	900	4,500
LsASF/N	---	---	---	27
LsASF = LsASF/N x N	---	---	---	2,700
ASF = LASF + LsASF	---	---	---	7,200

TABLE 3.9 (Conclusion)

METHOD B	PHYSICS SPECIALTIES			
	A	B	C	TOTAL
R	2	1	1	4
N	60	27	17	104
N/R	30.00	26.25	16.67	26
LASF/N	40	48	60	44.8+
LASF/R = N/R x LASF/N	1,200	1,260	1,000	1,185
LASF = LASF/R x R	2,400	1,260	1,000	4,660
LsASF/N	---	---	---	27
LsASF = LsASF/N x N	---	---	---	2,908
ASF = LASF + LsASF	---	---	---	7,568

NOTE: The assignable square feet per station in Table 3.9 are illustrative only and are not recommended as standards.

DISCUSSION

DETAILED METHOD

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

For each academic specialty:

- the additional number of class laboratories (R)

and for each class laboratory,

- the additional number of stations (station count = N/R), and
- the additional assignable square feet (ASF)

and for class laboratory service facilities,

- the additional assignable square feet (ASF).

PROGRAM DATA REQUIRED:

- A distribution of projected class laboratory weekly room-hours (WRH), by size of section (SS) for each academic specialty,

which implies

- a distribution of projected class laboratory weekly student-hours, (WSH), by size of section (SS) for each academic specialty.

These distributions are derived from:

- projected course enrollments for each academic specialty.

distributed by

- size of class laboratory section, and
- number of class laboratory hours of instruction required per station.

FACILITIES DATA REQUIRED:

For each academic specialty, the

- number of existing class laboratories (R)

and for each existing class laboratory

- the number of stations (station-count = N/R), and
- the assignable square feet (ASF),

and for existing class laboratory service facilities

- the assignable square feet (ASF).

UTILIZATION ASSUMPTIONS REQUIRED:

For each class laboratory:

- a room-utilization rate (RUR),
- a station-occupancy ratio (SOR), and
- the number of assignable square feet per station (ASF/N).

PROCEDURE:

1. For each academic specialty, obtain from the program analysis procedure (discussed in Manual Six) these distributions:
    - weekly room-hours (WRH) by size of section (SS), and
    - weekly student-hours (WSH) by size of section (SS).

    These are illustrated on Table 3.10.

2. For each academic specialty, establish as a matter of institutional policy:
    - a room-utilization rate (RUR), and
    - a station-occupancy ratio (SOR).

    These utilization criteria may be average values applied to all specialties within an academic program or specific values for each specialty. Sufficient variation exists among specialties in the non-scheduled use of class laboratories that a single utilization standard should not be adopted for all of them. Specific values ought to be applied to each academic specialty. In certain instances, it may be desirable to develop utilization criteria for specific rooms within an academic specialty. These utilization criteria are illustrated on Table 3.11.

3A. For each academic specialty, determine the number of stations (N) required to accommodate the projected weekly student-hours (WSH). (Method A).

This is the mathematical quotient derived by dividing the projected weekly student-hours (WSH) by the station-utilization ratio (SUR):

$$\text{Number of Stations} = (\text{Weekly Student-Hours})/(\text{Station-utilization Ratio})$$

$$N = (WSH)/(SUR)$$

3B. For each academic specialty, determine the number of stations required to accommodate the projected average section size ($\overline{SS}$). (Method B)

The number of stations may be determined on another basis. It is usually the case, that the capacity for a class laboratory (or a group of similar ones) is set on the basis of an instructional decision concerning the maximum laboratory section size. Hence, the number of stations may be determined by use of the projected average section size and the station-occupancy ratio rather than by use of the WSH/SUR ratio:

$$\text{Number of Stations per Room} = (\text{Projected Average Section Size})/(\text{Assumed Station-Occupancy Ratio})$$

$$N/R = (\overline{SS})/(SOR)$$

and

$$\text{Number of Stations} = (\text{Number of Stations per Room}) \times (\text{Number of Rooms})$$

$$N = (N/R) \times (R)$$

Although this alternate method (Method B) can be shown to be mathematically equivalent to the WSH/SUR method (Method A), it may produce numerically different results because of the sequence of the calculations. For a more complete complex discussion of the two methods see SEPARATE CLASS LABORATORY ESSAY (Section 3.6 of this manual).

4. For each academic specialty, determine the required number of rooms (R).

   This is the mathematical quotient derived by dividing the projected weekly room-hours (WRH) by the assumed room-utilization rate (RUR).

   Number of Rooms = (Weekly Room-Hours)/ (Room-Utilization Rate)

   $$R = (WRH)/(RUR)$$

   See the COMMENT section following Step 5 in Section 3.12 of this manual.

5. For each academic specialty, compare the existing with the projected distribution of rooms and number of stations.

   ■Note, it is possible that the results of this analysis may indicate the need for additional stations, but not for additional rooms. This situation requires an evaluation of all basic assumptions and a decision. The decision might be to:

   - not add stations, thereby increasing utilization rates
   - add stations to existing rooms, thereby reducing the number of assignable square feet per station
   - add stations in a new room, thereby lowering utilization rates

   For a discussion of the effect of the alternate methods of calculating stations see SEPARATE CLASS LABORATORY ESSAY, Section 3.6 of this manual.■

6. For each academic specialty, decide the additional class laboratories of each station count required, determine the design criteria and calculate the laboratory assignable square feet. For all class laboratory space in an academic unit (e.g., all biology specialties), determine the laboratory service assignable square feet.

   These calculations may be made on two bases, as illustrated in the example which follows. The two methods reflect the alternate ways of calculating student station requirements.

Note that an alternative method sometimes used to project the assignable square feet of class laboratory space including related service facilities is the use of a single-square-feet-per-station value which provides sufficient space for both laboratory space and the selected service facilities.

See the COMMENT section following Step 5 in Section 3.12 of this Manual.

Note also that the procedure outlined above makes no assumption about the quality of the existing class laboratory facilities. If some of the existing class laboratory space is of such poor quality that it will be abandoned or converted to other uses between the present time and the point in time to which the projected program data apply, then the existing facilities assumed in Step 5 should be adjusted to reflect only the class laboratories which will still exist at the time assumed as the target year for the projected program data.

EXAMPLE

DETAILED METHOD

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

For each academic specialty:

- the additional number of class laboratories (R)

and for each class laboratory

- the additional number of stations (station count = N/R), and
- the additional assignable square feet (ASF)

and for class laboratory service facilities,

- the additional assignable square feet (ASF)

PROCEDURE:

1. For each academic specialty, obtain from the program analysis procedure (discussed in Manual Six) these distributions:
    - weekly room-hours (WRH) by size of section (SS), and
    - weekly student-hours (WSH) by size of section (SS).

TABLE 3.10

PROJECTED WEEKLY ROOM-HOURS (WRH) AND WEEKLY STUDENT-HOURS (WSH) BY SIZE OF SECTION (SS) FOR EACH ACADEMIC SPECIALTY

BIOLOGY

SPECIALTY A			SPECIALTY B			SPECIALTY C		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
25	8	200	20	4	80	20	4	80
24	8	196	19	8	152	16	4	64
23	16	368	17	4	68	13	4	52
22	16	352	16	4	64	12	8	96
21	16	336	15	4	60	11	4	44
20	8	160	14	8	112	10	8	80
19	8	152	13	8	104	8	8	64
TOTAL	80	1,760	TOTAL	40	640	TOTAL	40	480

ZOOLOGY

SPECIALTY A			SPECIALTY B		
SS	WRH	WSH	SS	WRH	WSH
32	4	128	23	4	92
29	4	116	20	8	160
27	4	108	19	4	76
26	8	208	18	4	72
TOTAL	20	560	TOTAL	20	400

TABLE 3.10 (continued)

CHEMISTRY

SPECIALTY A			SPECIALTY B			SPECIALTY C		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
30	4	120	19	4	76	17	8	136
29	8	232	17	4	68	16	8	128
27	8	216	15	8	120	15	8	120
26	16	416	14	8	112	13	4	52
25	16	400	13	8	104	11	4	44
24	16	384	TOTAL	32	480	TOTAL	32	480
23	8	184						
22	4	88						
TOTAL	80	2,040						

GEOLOGY

SPECIALTY A			SPECIALTY B		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH
24	4	96	22	8	176
21	4	84	21	4	84
29	4	80	20	4	80
19	4	76	19	4	76
18	8	144	16	4	64
TOTAL	24	480	TOTAL	24	480

TABLE 3.10 (Conclusion)

PHYSICS

SPECIALTY A			SPECIALTY B			SPECIALTY C		
Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours	Size of Section	Weekly Room Hours	Weekly Student Hours
SS	WRH	WSH	SS	WRH	WSH	SS	WRH	WSH
28	5	140	24	5	120	14	3	42
27	5	135	21	5	105	12	3	36
26	5	130	20	5	100	9	6	54
24	10	240	19	5	95	8	6	48
23	10	230	TOTAL	20	420	TOTAL	18	180
22	10	220						
21	5	105						
TOTAL	50	1,200						

2. For each academic specialty, establish as a matter of institutional policy:

    - a room-utilization rate (RUR), and
    - a station-occupancy ratio (SOR).

TABLE 3.11

ASSUMED ROOM-UTILIZATION RATES (RUR), STATION-OCCUPANCY RATIOS (SOR), AND STATION-UTILIZATION RATES (SUR), FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	ASSUMED ROOM-UTILIZATION RATE	ASSUMED STATION-OCCUPANCY RATIO	ASSUMED STATION-UTILIZATION RATE
	RUR	SOR	SUR*
Biology A	22	.80	17.6
Biology B	20	.80	16.0
Biology C	20	.60	12.0
Zoology A	20	.80	16.0
Zoology B	20	.80	16.0
Chemistry A	20	.85	17.0
Chemistry B	20	.60	12.0
Chemistry C	20	.60	12.0
Geology A	25	.64	16.0
Geology B	25	.64	16.0
Physics A	25	.80	20.0
Physics B	21	.80	16.8
Physics C	20	.60	12.0

*SUR = (RUR) x (SOR)

NOTE: The utilization rates displayed in Table 3.11 are illustrative only and are not recommended as standards.

3A. For each academic specialty, determine the number of stations (N) required to accommodate the projected weekly student-hours (WSH). (Method A)

TABLE 3.12A

WEEKLY STUDENT-HOURS (WSH), STATION-UTILIZATION RATES (SUR), AND NUMBER OF STATIONS REQUIRED (N), FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	WEEKLY STUDENT-HOURS	STATION-UTILIZATION RATE	NUMBER OF STATIONS
	WSH	SUR	N = (WSH)/(SUR)
Biology A	1,760	17.6	100
Biology B	640	16.0	40
Biology C	480	12.0	40
Zoology A	560	16.0	35
Zoology B	400	16.0	25
Chemistry A	2,040	17.0	120
Chemistry B	480	12.0	40
Chemistry C	480	12.0	40
Geology A	480	16.0	30
Geology B	480	16.0	30
Physics A	1,200	20.0	60
Physics B	420	16.8	25
Physics C	180	12.0	15

3B. For each academic specialty, determine the number of stations required to accommodate the projected average section size ($\overline{SS}$). (Method B)

TABLE 3.12B

WEEKLY ROOM-HOURS (WRH), WEEKLY STUDENT-HOURS (WSH), AVERAGE STATION SIZE ($\overline{SS}$), ASSUMED STATION-OCCUPANCY RATES (SOR) AND NUMBER OF STATIONS PER ROOM (N/R) FOR EACH ACADEMIC SPECIALTY

	Weekly Room Hours	Weekly Student Hours	Average Section Size	Station-Occupancy Rates	Number of Stations Per Room
ACADEMIC SPECIALTY	WRH	WSH	$\overline{SS}$ = WSH/WRH	SOR	*N/R = $\overline{SS}$/SOR
Biology A	80	1,760	22	.80	27.50
Biology B	40	640	16	.80	20.00
Biology C	40	480	12	.60	20.00
Zoology A	20	560	28	.80	35.00
Zoology B	20	400	20	.80	25.00
Chemistry A	80	2,040	25.5	.85	30.00
Chemistry B	32	480	15	.60	25.00
Chemistry C	32	480	15	.60	25.00
Geology A	24	480	20	.64	31.25
Geology B	24	480	20	.64	31.25
Physics A	50	1,200	24	.80	30.00
Physics B	20	420	21	.80	26.25
Physics C	18	180	10	.60	16.67

*N/R = Station-Count

4. For each academic specialty, determine the required number of rooms (R).

TABLE 3.13

WEEKLY ROOM-HOURS (WRH), ASSUMED ROOM-UTILIZATION RATES (RUR), FRACTIONAL NUMBER OF ROOMS (R_F), AND NUMBER OF ROOMS REQUIRED (R) FOR EACH ACADEMIC SPECIALTY

ACADEMIC SPECIALTY	WEEKLY ROOM-HOURS	ASSUMED ROOM-UTILIZATION RATE	FRACTIONAL NUMBER OF ROOMS	NUMBER OF ROOMS
	WRH	RUR	R_F = WRH/RUR	R
Biology A	80	22	3.64	4
Biology B	40	20	2.00	2
Biology C	40	20	2.00	2
Zoology A	20	20	1.00	1
Zoology B	20	20	1.00	1
Chemistry A	80	20	4.00	4
Chemistry B	32	20	1.60	2
Chemistry C	32	20	1.60	2
Geology A	24	25	.96	1
Geology B	24	25	.96	1
Physics A	50	25	2.00	2
Physics B	20	21	0.95	1
Physics C	18	20	0.90	1

5. For each academic specialty, compare the existing with the projected distribution of rooms and number of stations (N).

TABLE 3.14

DIFFERENCES BETWEEN PROJECTED AND EXISTING CLASS LABORATORIES FOR EACH ACADEMIC SPECIALTY IN TOTAL NUMBER OF ROOMS AND TOTAL NUMBER OF STATIONS

ACADEMIC SPECIALTY	TOTAL NUMBER OF ROOMS			TOTAL NUMBER OF STATIONS					
				Method A			Method B		
	Projected	Existing	Difference	Projected	Existing	Difference	Projected	Existing	Difference
Biology A	4	4	-	100	100	--	110	100	10*
Biology B	2	0	2	40	0	40	40	0	40
Biology C	2	2	-	40	40	--	40	40	--
Zoology A	1	1	-	35	35	--	35	35	--
Zoology B	1	1	-	25	25	--	25	25	--
Chemistry A	4	2	2	120	60	60	120	60	60
Chemistry B	2	2	-	40	40	--	50	40	10*
Chemistry C	2	2	-	40	40	--	50	40	10*
Geology A	1	1	-	30	30	--	32	30	2*
Geology B	1	1	-	30	30	--	32	30	2*
Physics A	2	2	-	60	60	--	60	60	-
Physics B	1	1	-	25	25	--	27	25	2*
Physics C	1	1	-	15	15	--	17	15	2*
TOTALS	24	20	4	600	500	100	638	500	138

*Note that in certain instances under Method B additional stations but not additional rooms are required for some specialties. See the SEPARATE CLASS LABORATORY ESSAY. Note also that in practice "existing" numbers of rooms and stations may need to be adjusted to reflect the future abandonment of currently used class laboratory space.

6. For each academic specialty, decide the additional class laboratories of each station count, determine criteria, and calculate the laboratory assignable square feet (ASF). For all class laboratory space in an academic unit (e.g., all biology specialties), determine the laboratory service assignable square feet (ASF).

TABLE 3.15

ADDITIONAL CLASS LABORATORIES REQUIRED BY NUMBER OF ROOMS (R), NUMBER OF STATIONS (N), LABORATORY ASSIGNABLE-SQUARE-FEET-PER-STATION (LASF/N), LABORATORY ASSIGNABLE SQUARE FEET (LASF) FOR EACH ACADEMIC SPECIALTY

	ACADEMIC SPECIALTIES	
	Biology B	Chemistry A
R	2	2
N	40	60
LASF/N	40	36
LASF = N x LASF/N	1,600	2,160

TABLE 3.16

ADDITIONAL CLASS LABORATORY SERVICE REQUIRED BY LABORATORY SERVICE ASSIGNABLE-SQUARE-FEET-PER-STATION (LsASF/N), TOTAL LABORATORY SERVICE ASSIGNABLE SQUARE FEET (LsASF), AND ADDITIONAL LABORATORY SERVICE ASSIGNABLE SQUARE FEET FOR EACH ACADEMIC SPECIALTY

	ACADEMIC SPECIALTIES	
	Biology	Chemistry
Existing Stations	140	140
Added Stations	40	60
Total Stations	180	200
LsASF/N	8	20
LsASF - Total	1,440	4,000
LsASF - Existing	1,120	3,280
LsASF - Additional	320	720

NOTE: The assignable square feet per station figures in Tables 3.15 and 3.16 are illustrations only and are not recommended as standards.

INTRODUCTORY COMMENTS

GENERAL PLANNING METHOD A

General planning methods such as those described on succeeding pages can be very useful. They can also be misused easily and therefore may be dangerous in the hands of the novice. The limitations of these general planning methods are so severe that their use should be restricted to those institutions which can monitor constantly the validity of the assumptions involved. When such validity can be assured, general planning methods serve as adequate "rule-of-thumb" estimates of over all class laboratory requirements. If, however, the application of general planning methods results in a decision to add, alter, or abandon existing class laboratories, then these generalized estimates must be modified by a complete analysis as outlined in the preceding DETAILED METHOD section.

General planning methods rely entirely on averages and yield only total numbers for each academic unit. They assume an average room-utilization rate for all class laboratories within an academic unit and an average station-occupancy ratio for all stations within an academic unit. For the evaluation of existing space they yield only total weekly room-hours and total weekly student-hours for each academic unit; for projections of class laboratory requirements for a new institution they provide only the total number of rooms, stations, and assignable square feet for each academic unit; and, for projections of class laboratory requirements for an existing institution they provide only the total additional number of rooms, stations, and assignable square feet for each academic unit.

DISCUSSION

GENERAL PLANNING METHOD A

EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

DATA TO BE DETERMINED:

For each academic unit, the total number of:

- weekly room-hours (WRH), and
- weekly student-hours (WSH).

which existing class laboratories can accommodate.

PROGRAM DATA REQUIRED:

None

FACILITIES DATA REQUIRED:

For each academic unit, the:

- number of existing class laboratories
- number of existing class laboratory stations
- number of existing class laboratory assignable square feet
- number of existing class laboratory service facilities assignable square feet.

UTILIZATION ASSUMPTIONS REQUIRED:

For each academic unit:

- an average room-utilization rate (RUR)
- an average station-occupancy ratio (SOR), and
- an average number of assignable square feet per station including laboratory service facilities (ASF/N).

PROCEDURE:

1. For each academic unit, obtain the facilities data:

   - number of existing class laboratories
   - number of stations in existing class laboratories
   - number of existing class laboratory assignable square feet
   - number of existing class laboratory service facilities assignable square feet

2. For each academic unit establish as a matter of institutional policy:

   - an average room-utilization rate (RUR),
   - an average station-occupancy ratio (SOR), and
   - an average number of assignable square feet per station including related laboratory service facilities (ASF/N).

3. For each academic unit, determine the number of weekly room-hours (WRH) which can be accommodated in existing class laboratories.

   This weekly room-hour capacity (WRH_C) is the mathematical product of the number of rooms (R) and the average room-utilization rate (RUR):

   Weekly Room-Hour Capacity = (Number of Rooms) x (Average RUR)

$$WRH_C = (R) \times (RUR)$$

4. For each academic unit, determine the total number of weekly student-hours (WSH) which can be accommodated in existing class laboratories.

   This weekly student-hour capacity (WSH_C) is the mathematical product of the total number of stations (N) and the average station-utilization rate:

   Weekly Student-Hour Capacity = (Number of Stations) x (Station-Utilization Rate)

$$WSH_C = (N) \times (SUR)^*$$

*SUR = (RUR) x (SOR)

5. An alternate method for determining the total number of weekly student-hours (WSH) which can be accommodated in existing class laboratory space involves the use of the ratio of assignable square feet to weekly student-hour (ASF/WSH).

   In addition to an assumed room-utilization rate (RUR) and an assumed station-occupancy ratio (SOR), an average number of square-feet-per-class laboratory station (ASF/N) (including class laboratory service facilities must be assumed for each academic unit. The assignable square-feet-per weekly student-hour (ASF/WSH) ratio is derived as follows:

$$\text{ASF/WSH} = \frac{\text{(Average Assignable-Square-Feet-per-Station)}}{\text{(Average Room Utilization Rate)} \times \text{(Station-Occupancy Ratio)}}$$

$$= \frac{\text{(ASF/N)}}{\text{(RUR)} \times \text{(SOR)}}$$

$$= \frac{\text{(ASF/N)}}{\text{(SUR)}}$$

   The number of weekly student-hours which the total class laboratory and related service assignable square feet can accommodate is then estimated by dividing those square feet by the ASF/WSH ratio.

COMMENT ON THE PROCEDURE:

See the INTRODUCTORY COMMENTS ON GENERAL PLANNING METHOD A for the limitations of this procedure for analyzing class laboratory capacity.

Note also that this procedure makes no assumption about the quality of the class laboratory space. Class laboratory facilities judged to be of such poor quality that they should be abandoned ought to be subtracted from the existing facilities assumed in Step 1 of this PROCEDURE.

EXAMPLE
GENERAL PLANNING METHOD A
EVALUATION OF EXISTING CLASS LABORATORY CAPACITY

DATA TO BE DETERMINED:

For each academic unit, the total number of:

- weekly room-hours (WRH), and
- weekly student-hours (WSH).

which existing class laboratories can accommodate.

PROCEDURE:

1. For each academic unit, obtain the facilities data:

TABLE 3.17
CLASS LABORATORY FACILITIES DATA FOR
EACH ACADEMIC UNIT

ACADEMIC UNIT	TYPE OF ROOM	NUMBER OF ROOMS	TOTAL STATIONS	TOTAL ASSIGNABLE SQUARE FEET
		R	N	ASF
Biology	Lab	6	140	5,600
Biology	Service	-	---	1,120
Total	-	-	---	6,720
Zoology	Lab	2	60	2,100
Zoology	Service	-	--	780
Total	-	-	--	2,880
Chemistry	Lab	6	140	5,840
Chemistry	Service	-	---	3,280
Total	-	-	---	9,120
Geology	Lab	2	60	2,400
Geology	Service	-	--	480
Total	-	-	--	2,880
Physics	Lab	4	100	4,500
Physics	Service	-	---	2,700
Total	-	-	---	7,200

2. For each academic unit establish as a matter of institutional policy:

   - an average room-utilization rate (RUR),
   - an average station-occupancy ratio (SOR), and
   - an average number of assignable square feet per station including related laboratory service facilities (ASF/N).

TABLE 3.18

AVERAGE ROOM-UTILIZATION RATE (RUR), AVERAGE STATION OCCUPANCY RATIO (SOR), AND AVERAGE NUMBER OF ASSIGNABLE SQUARE FEET PER STATION (ASF/N) FOR EACH ACADEMIC AREA

ACADEMIC UNIT	AVERAGE ROOM UTILIZATION RATE	AVERAGE STATION OCCUPANCY RATIO	AVERAGE STATION UTILIZATION RATE	AVERAGE-SQUARE-FEET-PER-STATION*
	RUR	SOR	SUR**	ASF/N
Biology	20	.80	16	48
Zoology	20	.80	16	48
Chemistry	20	.75	15	60
Geology	25	.64	16	48
Physics	24	.75	18	72

*Including class laboratory service areas.
**SUR = (RUR) x (SOR)

3. For each academic unit, determine the number of weekly room-hours (WRH) which can be accommodated in existing class laboratories.

TABLE 3.19

NUMBER OF WEEKLY ROOM-HOURS FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	NUMBER OF ROOMS	AVERAGE ROOM UTILIZATION RATE	WEEKLY ROOM-HOUR CAPACITY (WRH_c)
	R	RUR	(R) x (RUR)
Biology	6	20	120
Zoology	2	20	40
Chemistry	6	20	120
Geology	2	25	50
Physics	4	24	96

4. For each academic unit, determine the total number of weekly student-hours (WSH) which can be accommodated in existing class laboratories.

TABLE 3.20
TOTAL WEEKLY STUDENT HOURS (WSH) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	TOTAL STATIONS	ASSUMED AVERAGE STATION-UTILIZATION RATE	WEEKLY STUDENT-HOUR CAPACITY (WSH_c)
	N	SUR	(N) x (SUR)
Biology	140	16	2,240
Zoology	60	16	960
Chemistry	140	15	2,100
Geology	60	16	960
Physics	100	18	1,800

5. An alternate method for determining the total number of weekly student-hours (WSH) which can be accommodated in existing class laboratory space employs the ratio of assignable square feet to weekly student hours (ASF/WSH).

TABLE 3.21
TOTAL WEEKLY STUDENT HOURS (WSH) FOR EACH ACADEMIC UNIT - ALTERNATE METHOD

ACADEMIC UNIT	TOTAL ASSIGNABLE SQUARE FEET*	ASSIGNABLE-SQUARE-FEET-PER-WEEKLY STUDENT-HOUR	WEEKLY STUDENT-HOUR CAPACITY (WSH_c)
	ASF	ASF/WSH	(ASF/WSH)
Biology	6,720	3.0 = 48 ÷ (20 x .80)	2,240
Zoology	2,880	3.0 = 48 ÷ (20 x .80)	960
Chemistry	9,120	4.0 = 60 ÷ (20 x .75)	2,280
Geology	2,880	3.0 = 48 ÷ (25 x .64)	960
Physics	7,200	4.0 = 72 ÷ (24 x .75)	1,800

*Includes class laboratory service space.

Note: The WSH_c in steps 4 and 5 agree in all cases except for Chemistry. This exception occurs because the assumed ASF/N for chemistry is 60, but the actual ASF/N is 65+.

Note also that this example makes no allowance for class laboratories of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the facilities data in Step 1.

DISCUSSION

GENERAL PLANNING METHOD A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

For each academic unit, the:

- total number of class laboratories required (R)
- total number of stations (N)
- total assignable square feet, including class laboratory service facilities (ASF).

PROGRAM DATA REQUIRED:

For each academic unit, the:

- projected total class laboratory weekly room-hours (WRH),
- projected total class laboratory weekly student-hours (WSH).

FACILITIES DATA REQUIRED:

None

UTILIZATION ASSUMPTIONS REQUIRED

For each academic unit, an:

- average room-utilization rate (RUR)
- average station-occupancy ratio (SOR)
- average number of assignable square feet per station, including laboratory service facilities (ASF/N)

PROCEDURE:

1. For each academic unit, obtain the program data:
    - total projected class laboratory weekly room hours (WRH), and
    - total projected class laboratroy weekly student-hours (WSH).

These numbers may be available either from the detailed program analysis procedures discussed in Manual Six, or from estimates. Estimates of weekly student-hours, for example, may be based upon an assumed average number of class laboratory hours per FTE student. For instance, if it is assumed that each FTE student will spend, on the average, 4 hours per week in class laboratories then for a projected student body of 2,400 students there will be 9,600 weekly student-hours of class laboratory instruction.

$$\begin{aligned} \text{WSH} &= (\text{FTE students}) \times (\text{WSH per FTE student}) \\ &= (2{,}400) \times (4) \\ &= 9{,}600 \text{ weekly student hours} \end{aligned}$$

If it is further assumed that biology weekly student-hours are 30 percent of the total then there will be 2,880 weekly student-hours of instruction in biology.

If it is further assumed that the average laboratory section size in biology will be 18 students then there will be 160 weekly room hours (WRH).

$$\begin{aligned} \text{Biology WRH} &= \frac{(\text{WSH})}{(\text{Average Section Size})} \\ &= \frac{(2{,}880)}{(18)} \\ &= 160 \end{aligned}$$

2. For each academic unit, establish as a matter of institutional policy:

   - an average room-utilization rate (RUR),
   - an average station-occupancy ratio (SOR), and
   - an average number of assignable square feet per station, including related service areas (ASF/N).

   For a discussion of the range of values associated with assignable square feet per station see Section 3.4 of this manual.

3. For each academic unit, determine the required number of rooms.

   This is the mathematical quotient obtained by dividing the total projected weekly room-hours (WRH) by the assumed average room-utilization rate (RUR).

4. For each academic unit, determine the required number of stations (N).

   This is the mathematical quotient obtained by dividing the total projected weekly student-hours (WSH) by the assumed average station-utilization rate (SUR).

   The SUR in this example is derived from

   Biology SUR = (Biology RUR) x (Biology SOR)

5. For each academic unit, determine the number of assignable square feet of class laboratory space required, including the related service facilities (ASF).

   This is the mathematical product of the number of stations (N) and the assumed number of assignable square feet per station (ASF/N).

COMMENT ON THE PROCEDURE:

See the INTRODUCTORY COMMENTS ON GENERAL PLANNING METHOD A for the limitations of this PROCEDURE for projecting class laboratory requirements.

EXAMPLE

GENERAL PLANNING METHOD A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

For each academic unit, the:

- total number of class laboratories required (R)
- total number of stations (N)
- total assignable square feet, including class laboratory service facilities (ASF)

PROCEDURE:

1. For each academic unit, obtain the program data:
    - total projected class laboratory weekly room-hours (WRH), and
    - total projected class laboratory weekly student-hours (WSH).

TABLE 3.22

TOTAL PROJECTED CLASS LABORATORY WEEKLY ROOM-HOURS (WRH) AND TOTAL PROJECTED CLASS LABORATORY WEEKLY STUDENT-HOURS (WSH) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
	WRH	WSH
Biology	160	2,880
Zoology	40	960
Chemistry	144	3,000
Geology	48	960
Physics	88	1,800

2. For each academic unit, establish as a matter of institutional policy:

   - an average room-utilization rate (RUR),
   - an average station-occupancy ratio (SOR),
   - an average number of assignable square feet per station, including related service facilities (ASF/N).

TABLE 3.23

AVERAGE ROOM-UTILIZATION RATE (RUR), AVERAGE STATION-OCCUPANCY RATIO (SOR), AND AVERAGE ASSIGNABLE SQUARE FEET PER STATION, INCLUDING RELATED SERVICE FACILITIES (ASF/N) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	AVERAGE ROOM-UTILIZATION RATE	AVERAGE STATION-OCCUPANCY RATIO	AVERAGE STATION-UTILIZATION RATE	AVERAGE ASSIGNABLE-SQUARE-FEET-PER-STATION*
	RUR	SOR	SUR**	ASF/N
Biology	20	.80	16	48
Zoology	20	.80	16	48
Chemistry	20	.75	15	60
Geology	25	.64	16	48
Physics	24	.75	18	72

* Including class laboratory service areas
** SUR = (RUR) x (SOR)

NOTE: These utilization rates are illustrative only and are not recommended as standards.

3. For each academic unit, determine the required number of rooms:

TABLE 3.24

REQUIRED NUMBER OF ROOMS FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	WEEKLY ROOM-HOURS	ROOM-UTILIZATION RATE	TOTAL NUMBER OF ROOMS
	WRH	RUR	R = (WRH)/(RUR)
Biology	160	20	8.00 = 8
Zoology	40	20	2.00 = 2
Chemistry	144	20	7.20 = 8
Geology	48	25	1.92 = 2
Physics	88	24	3.25 = 4

4. For each academic unit, determine the required number of stations.

TABLE 3.25

REQUIRED NUMBER OF ROOMS FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	WEEKLY STUDENT HOURS	STATION-UTILIZATION RATE	TOTAL NUMBER OF STATIONS
	WSH	SUR	N = (WSH)/(SUR)
Biology	2,880	16	180
Zoology	960	16	60
Chemistry	3,000	15	200
Geology	960	16	60
Physics	1,800	18	100

5. For each academic unit, determine the number of assignable square feet of class laboratory space required, including the related service facilities (ASF).

TABLE 3.26

NUMBER OF ASSIGNABLE SQUARE FEET OF CLASS LABORATORY SPACE REQUIRED, INCLUDING THE RELATED SERVICE FACILITIES (ASF) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	TOTAL NUMBER OF STATIONS	ASSIGNABLE-SQUARE-FEET PER STATION	TOTAL ASSIGNABLE SQUARE FEET
	N	ASF/N	(N) x (ASF/N) = ASF
Biology	180	48	8,640
Zoology	60	48	2,880
Chemistry	200	60	12,000
Geology	60	48	2,880
Physics	100	72	7,200

Note that the assignable square feet per station assumptions are illustrative only and are not recommended as standards.

DISCUSSION

GENERAL PLANNING METHOD A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

For each academic unit, the:

- additional number of class laboratories required (R),
- additional number of stations (N), and
- additional assignable square feet including class laboratory service facilities (ASF).

PROGRAM DATA REQUIRED:

For each academic unit, the:

- projected total class laboratory weekly room-hours (WRH), and
- projected total class laboratory weekly student-hours (WSH)

FACILITIES DATA REQUIRED:

For each academic unit, the:

- number of existing class laboratories,
- number of existing class laboratory stations,
- number of assignable square feet in existing class laboratories, and
- number of assignable square feet in existing class laboratory service facilities.

UTILIZATION ASSUMPTIONS REQUIRED:

For each academic unit, an:

- average room-utilization rate (RUR),
- average station-occupancy ratio (SOR), and
- average number of assignable square feet per station, including laboratory service areas (ASF/N).

PROCEDURE:

1. For each academic unit, obtain the program data:

   - total projected class laboratory weekly room hours (WRH), and
   - total projected laboratory weekly student-hours (WSH).

   These numbers may be available either from the detailed program analysis procedures discussed in Manual Six, or from estimates. Estimates of weekly student-hours, for example, may be based upon an assumed average number of class laboratory hours per FTE student. For instance, if it is assumed that each FTE student will spend, on the average, 4 hours per week in class laboratories then for a projected student body of 2,400 students there will be 9,600 weekly student-hours of class laboratory instruction.

$$\begin{aligned} \text{WSH} &= (\text{FTE students}) \times (\text{WSH per FTE student}) \\ &= (2{,}400) \times (4) \\ &= 9{,}600 \text{ weekly student hours} \end{aligned}$$

   If it is further assumed that biology weekly student-hours are 30 percent of the total then there will be 2,880 weekly student-hours of instruction in biology.

   If it is further assumed that the average laboratory section size in biology will be 18 students then there will be 160 weekly room hours (WRH).

$$\begin{aligned} \text{Biology WRH} &= \frac{(\text{WSH})}{(\text{Average Section Size})} \\ &= \frac{(2{,}880)}{(18)} \\ &= 160 \text{ weekly room-hours} \end{aligned}$$

2. For each academic unit, establish as a matter of institutional policy:

   - an average room-utilization rate (RUR),
   - an average station-occupancy ratio (SOR), and
   - an average number of assignable square feet per station, including related service areas (ASF/N).

   For a discussion of the range of values associated with assignable square feet per station see Section 3.4 of this manual.

3. For each academic unit, determine the required number of rooms (R).

   This is the mathematical quotient obtained by dividing the total projected weekly room-hours (WRH) by the assumed average room-utilization rate (RUR).

4. For each academic unit, determine the number of additional rooms (R) required between the present and the projected year.

   This is the mathematical difference obtained by subtracting the existing number of rooms from the projected need.

5. For each academic unit, determine the number of stations (N) required for the projected year.

   This is the mathematical quotient obtained by dividing the total projected weekly student-hours (WSH) by the assumed station-utilization rate (SUR).

6. For each academic unit, determine the number of additional stations (N) required between the present and the projected year.

   This is the mathematical difference obtained by subtracting the existing number of stations from the projected need.

7. For each academic unit, determine the number of assignable square feet, including related service areas, required for the projected year (ASF).

   This is the mathematical product of the number of stations (N) and the assumed number of assignable square feet per station (ASF/N).

8. For each academic unit, determine the number of additional assignable square feet, including related service areas, required between the present and the projected year (ASF).

   This is the mathematical difference obtained by subtracting the existing number of assignable square feet from the projected need.

COMMENT ON THE PROCEDURE:

See the INTRODUCTORY REMARKS - GENERALIZED PLANNING METHOD A for the limitations of this PROCEDURE in projecting additional class laboratory requirements. Note also that this PROCEDURE makes no assumptions about the quality of existing class laboratory space. Class laboratories judged to be of such poor quality that they should be abandoned ought to be subtracted from the existing facilities assumed in Steps 4, 6, and 8 of the PROCEDURE.

EXAMPLE

GENERAL PLANNING METHOD A

PROJECTION OF CLASS LABORATORY REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

For each academic area, the:

- additional number of class laboratories required (R),
- additional number of stations (N), and
- additional assignable square feet, including class laboratory service facilities (ASF).

PROCEDURE:

1. For each academic unit, obtain the program data:
    - total projected class laboratory weekly room-hours (WRH), and
    - total projected class laboratory weekly student-hours (WSH).

TABLE 3.27

TOTAL PROJECTED CLASS LABORATORY WEEKLY ROOM-HOURS (WRH) AND TOTAL PROJECTED CLASS LABORATORY WEEKLY STUDENT-HOURS (WSH) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
	WRH	WSH
Biology	160	2,880
Zoology	40	960
Chemistry	144	3,000
Geology	48	960
Physics	88	1,800

2. For each academic unit, establish as a matter of institutional policy:

   - an average room-utilization rate (RUR),
   - an average station-occupancy ratio (SOR), and
   - an average number of assignable square feet per station, including related service facilities (ASF/N).

TABLE 3.28

AVERAGE ROOM-UTILIZATION RATE (RUR), AVERAGE STATION-OCCUPANCY RATIO (SOR), AND AVERAGE ASSIGNABLE SQUARE FEET PER STATION, INCLUDING RELATED SERVICE FACILITIES (ASF/N) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	AVERAGE ROOM-UTILIZATION RATE	AVERAGE STATION-OCCUPANCY RATIO	AVERAGE STATION-UTILIZATION RATE	AVERAGE ASSIGNABLE-SQUARE-FEET-PER-STATION*
	RUR	SOR	SUR**	ASF/N
Biology	20	.80	16	48
Zoology	20	.80	16	48
Chemistry	20	.75	15	60
Geology	25	.64	16	48
Physics	24	.75	18	72

* Including class laboratory service areas
**SUR = (RUR) x (SOR)

NOTE: These utilization rates are illustrative only and are not recommended as standards.

3. For each academic unit, determine the required number of rooms (R):

TABLE 3.29

REQUIRED NUMBER OF ROOMS (R) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	WEEKLY ROOM-HOURS	ROOM-UTILIZATION RATE	TOTAL NUMBER OF ROOMS
	WRH	RUR	R = (WRH)/(RUR)
Biology	160	20	8.00 = 8
Zoology	40	20	2.00 = 2
Chemistry	144	20	7.20 = 8
Geology	48	25	1.92 = 2
Physics	88	24	3.25 = 4

4. For each academic unit, determine the number of additional rooms (R) required between the present and the projected year.

TABLE 3.30

NUMBER OF ADDITIONAL ROOMS (R) REQUIRED FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	PROJECTED NUMBER OF ROOMS	EXISTING NUMBER OF ROOMS	ADDITIONAL NUMBER OF ROOMS
Biology	8	6	2
Zoology	2	2	0
Chemistry	8	6	2
Geology	2	2	0
Physics	4	4	0

5. For each academic unit, determine the number of stations (N) required for the projected year.

TABLE 3.31

NUMBER OF STATIONS (N) REQUIRED FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	WEEKLY STUDENT-HOURS	STATION-UTILIZATION RATE	TOTAL NUMBER OF STATIONS
	WSH	SUR	N = (WSH)/(SUR)
Biology	2,880	16	180
Zoology	960	16	60
Chemistry	3,000	15	200
Geology	960	16	60
Physics	1,800	18	100

6. For each academic unit, determine the number of additional stations (N) required between the present and the projected year.

TABLE 3.32

NUMBER OF ADDITIONAL STATIONS (N) REQUIRED FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	PROJECTED NUMBER OF STATIONS	EXISTING NUMBER OF STATIONS	ADDITIONAL NUMBER OF STATIONS
Biology	180	140	40
Zoology	60	60	0
Chemistry	200	140	60
Geology	60	60	0
Physics	100	100	0

7. For each academic unit, determine the number of assignable square feet (ASF), including related services areas, required for the projected year.

TABLE 3.33

NUMBER OF ASSIGNABLE SQUARE FEET (ASF) FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	TOTAL NUMBER OF STATIONS	ASSIGNABLE SQUARE FEET PER STATION	TOTAL ASSIGNABLE SQUARE FEET
	N	ASF/N	ASF = (ASF/N) x (N)
Biology	180	48	8,640
Zoology	60	48	2,880
Chemistry	200	60	12,000
Geology	60	48	2,880
Physics	100	72	7,200

8. For each academic unit, determine the number of additional assignable square feet, including related service areas, required between the present and the projected year (ASF).

TABLE 3.34

NUMBER OF ADDITIONAL ASSIGNABLE SQUARE FEET
REQUIRED FOR EACH ACADEMIC UNIT

ACADEMIC UNIT	PROJECTED ASSIGNABLE SQUARE FEET	EXISTING ASSIGNABLE SQUARE FEET	ADDITIONAL ASSIGNABLE SQUARE FEET
Biology	8,640	6,720	1,920
Zoology	2,880	2,880	0
Chemistry	12,000	9,120	2,880
Geology	2,880	2,880	0
Physics	7,200	7,200	0

INTRODUCTORY COMMENTS

GENERAL PLANNING METHOD B

The general planning methods described on succeeding pages can be very useful in certain limited applications. They can also be applied inappropriately and therefore may be very dangerous in the hands of the novice. These methods depend entirely on the validity of one average number and yield only one rough-estimate answer. When the validity of the average can be demonstrated, then the resulting estimate has some utility as a rough estimate. Ultimately, however, the evaluation and projection of class laboratory requirements must take the form of the analysis outlined in the preceding DETAILED METHOD section.

Method B uses assignable square feet per FTE student as its only criterion. For the evaluation of existing space Method B yields an estimate of the number of FTE students which can be accommodated in the existing class laboratory space; for projections of class laboratory space for a new institution it provides only an estimate of the total assignable square feet required; for projections of class laboratory space for an existing institution it provides only the total additional assignable square feet required.

DISCUSSION

GENERAL PLANNING METHOD B

EVALUATION OF THE CAPACITY OF EXISTING CLASS LABORATORY ASSIGNABLE SQUARE FEET

DATA TO BE DETERMINED:

- Total number of FTE students which existing class laboratories can accommodate.

PROGRAM DATA REQUIRED:

None

FACILITIES DATA REQUIRED:

- Total* assignable square feet existing in existing class laboratories (ASF).

UTILIZATION ASSUMPTIONS REQUIRED:

- Average number of total* class laboratory assignable square feet required per FTE student (ASF/FTE Sn).

PROCEDURES:

1. Obtain the total* assignable square feet in class laboratories (ASF).

2. Establish on the basis of institutional practice the average number of total* class laboratory assignable square feet required per FTE student (ASF/FTE Sn).

3. Determine the total number of FTE students which existing class laboratories can accommodate.

   This is the mathematical quotient obtained by dividing the existing total assignable square feet of class laboratory space by the assumed average number of total assignable square feet required per FTE student.

COMMENT ON THE PROCEDURE:

See the INTRODUCTORY COMMENTS - GENERAL PLANNING METHOD B for the limitations of the procedure in evaluation of capacity of existing class laboratory facilities. Note also that this PROCEDURE makes no assumption about the quality of existing class laboratory facilities.

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*"Total" implies the inclusion of class laboratory service facilities assignable square feet.

EXAMPLE
GENERAL PLANNING METHOD B
EVALUATION OF THE CAPACITY OF EXISTING CLASS LABORATORY ASSIGNABLE SQUARE FEET

DATA TO BE DETERMINED:

- Total number of FTE students which existing class laboratories can accommodate.

PROCEDURES:

1. Obtain the total* assignable square feet (ASF) in existing class laboratories (ASF).

   Class Laboratory ASF = 28,800 assignable square feet.

2. Establish on the basis of institutional practice the average number of total* class laboratory assignable square feet required per FTE student (ASF/FTESn):

   Class laboratory ASF/FTESn = 16 assignable square feet per FTE student

3. Determine the total number of FTE students which existing class laboratory space can accommodate:

   FTESn = (ASF)/(ASF/FTESn)

   = (28,800)/(16)

   = 1,800 FTE students

Note that this example makes no allowance for class laboratory assignable square feet of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the facilities data in Step 1.

---

*"Total" implies the inclusion of class laboratory service facilities assignable square feet.

DISCUSSION

GENERAL PLANNING METHOD B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

- Total* assignable square feet of class laboratory space required (ASF).

PROGRAM DATA REQUIRED:

- Projected total FTE students.

FACILITIES DATA REQUIRED:

None.

UTILIZATION ASSUMPTIONS REQUIRED:

- Average number of total class laboratory assignable square feet required per FTE student.

PROCEDURE:

1. Obtain the projected total number of FTE students (FTESn).
2. Establish as an institutional goal, or on the basis of external criteria, the average number of total* class laboratory assignable square feet required per FTE student (ASF/FTESn).
3. Determine the total* assignable square feet of class laboratory space required (ASF).

   This is the mathematical product obtained by multiplying the projected total FTE students by the assumed average number of total* class laboratory assignable square feet per FTE student.

COMMENT ON THE PROCEDURE:

See the INTRODUCTORY COMMENTS - GENERAL PLANNING METHOD B for the limitations of this PROCEDURE in projecting class laboratory assignable square feet.

---

*"Total" implies the inclusion of class laboratory service facilities assignable square feet.

EXAMPLE

GENERAL PLANNING METHOD B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

- Total* assignable square feet of class laboratory space required (ASF).

PROCEDURE:

1. Obtain the projected total number of FTE students (FTESn):

   FTESn = 2,400 FTE students

2. Establish as an institutional goal, or on the basis of external criteria, the average number of total* class laboratory assignable square feet per FTE student (ASF/FTESn).

   Class laboratory ASF/FTESn = 14 assignable square feet per FTE student

3. Determine the total* assignable square feet of class laboratory space required (ASF):

   Class laboratory ASF = (FTESn) x (Class laboratory ASF/FTESn)

   = (2,400) x (14)

   = 33,600 assignable square feet

---

*"Total" implies the inclusion of class laboratory service facilities assignable square feet.

DISCUSSION

GENERAL PLANNING METHOD B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- Additional total* assignable square feet of class laboratory space required (ASF).

PROGRAM DATA REQUIRED:

- Projected total FTE students (FTESn).

FACILITIES DATA REQUIRED:

- Total* assignable square feet in existing class laboratories

UTILIZATION ASSUMPTIONS REQUIRED:

- Average number of total* class laboratory assignable square feet required per FTE student (ASF/FTESn).

PROCEDURE:

1. Obtain the projected total number of FTE students (FTESn).

2. Establish as an institutional goal, or on the basis of external criteria, the average number of total* class laboratory assignable square feet required per FTE student (ASF/FTESn).

3. Determine the total* assignable square feet of class laboratory space required (ASF).

   This is the mathematical product obtained by multiplying the projected total FTE students by the assumed average number of total* class laboratory assignable square feet per FTE Student.

4. Determine the number of additional total* class laboratory assignable square feet (ASF) required between the present and the projected year.

   This is the mathematical difference obtained by subtracting the existing number of total* class laboratory assignable square feet from the projected need.

---

*"Total" implies the inclusion of class laboratory service facilities assignable square feet.

COMMENT ON THE PROCEDURE:

See the INTRODUCTORY COMMENTS - GENERAL PLANNING METHOD B for the limitations of this PROCEDURE in projection of additional class laboratory assignable square feet.

Note also that this procedure makes no assumptions about the quality of existing class laboratory facilities.

EXAMPLE

GENERAL PLANNING METHOD B

PROJECTION OF CLASS LABORATORY ASSIGNABLE SQUARE FEET FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- Additional total* assignable square feet of class laboratory space required (ASF).

PROCEDURES:

1. Obtain the projected total number of FTE students (FTE Sn):

   FTE Sn = 2,400 FTE students

2. Establish as an institutional goal, or on the basis of external criteria, the average number of total* class laboratory assignable square feet required per FTE student (ASF/FTE Sn):

   Class Laboratory ASF/FTE Sn = 14 assignable square feet per FTE student

3. Determine the total* assignable square feet of class laboratory space required (ASF):

   Class Laboratory ASF = (FTE Sn) x (ASF/FTE Sn)
   = (2,400) x (14)
   = 33,600 assignable square feet

4. Determine the number of additional total* class laboratory assignable square feet (ASF) required between the present and the projected year:

   Additional ASF = (Projected ASF) - (Existing ASF)
   = (33,600) - (28,800)
   = 4,800 assignable square feet

Note that this example makes no allowance for class laboratory assignable square feet of such poor quality that they should be abandoned. Where such an adjustment is necessary, it should be reflected in the existing ASF data in Step 4.

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*"Total" implies the inclusion of class laboratory service facilities assignable square feet.

CLASS LABORATORY UTILIZATION AND UNIT FLOOR AREA CRITERIA

ROOM TYPE: Class Laboratory Facilities

ROOM TYPE CODES:

210	Class Laboratory
215	Class Laboratory Service
220	Special Class Laboratory
225	Special Class Laboratory Service
230	Individual Study Laboratory
235	Individual Study Laboratory Service

UTILIZATION CRITERIA:

Two measures of utilization have been assumed in the evaluation and the projection of class laboratory requirements: a room-utilization rate and a station-occupancy ratio. It is important to recognize that these are not independent measures. Frequently, an increase in the room-utilization rate occurs at the expense of the station-occupancy ratio. Consider, for example, a one-section course of 30 students meeting in a class laboratory with 30 stations. If one more student enrolls in that course and it is divided into two sections of 15 and 16 students, then the room-utilization rate is doubled but the station-occupancy ratio is cut in half.

In general, a relatively lower room-utilization rate is justified in upper division level courses and in certain academic specialties where the amount of non-scheduled use is large. The academic specialties for which a relatively lower room-utilization rate of 14 to 18 hours per week might be considered appropriate are:

> Architecture, Landscape Architecture, Planning, Fine Arts, Foreign Languages, Library Science, and similar academic specialties.

Relatively higher room-utilization rates may be expected in certain academic specialties whre little non-scheduled use occurs.

The academic specialties for which a relatively higher room-utilization rate of 22 to 26 hours per week might be considered appropriate are:

> Area Studies, Business and Management, Computer and Information Sciences, Mathematics, some Social Sciences (such as History, Philosophy, Economics, and Political Science), and similar academic specialties

In general, the station-occupancy ratio is most likely to reach its maximum value for multi-sectioned lower division courses, particularly at the freshmen level. In most instances, the station-occupancy ratio can be expected to decrease as the level of the course and the degree of specialization increase.

For lower division laboratory courses a station-occupancy ratio in the range of .75 to .85 might be considered appropriate, for upper division courses a station-occupancy ratio of .50 to .70 might be more appropriate.

UNIT FLOOR AREA CRITERA:

Tabulated by

- HEGIS Discipline Specialty
- Course Level
- Specific Course

Laboratory furniture varies considerably in its design and dimensions. Moreover, many academic specialties require laboratory equipment in the class laboratory beyond the actual bench space or work surface provided each student. An example is a fume hood in a Chemistry laboratory. In planning new facilities or in the replacement of laboratory equipment in existing facilities, it is important to first choose the kind and number of each piece of laboratory equipment required, and then to make dimensioned lay-outs of actual arrangements in the class laboratories.

As generalized planning guides, the following ranges of class laboratory unit floor area criteria may be useful. It should be noted that different equipment configurations and the amount of circulation space within the class laboratory affect these unit area allowances.

TABLE 3.35

CLASS LABORATORY STUDENT STATION UNIT FLOOR AREA CRITERIA

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
0100	Agriculture and Natural Resources				
0102	Agronomy	Lower	Soils	30-40	50-60
		Upper	Soil Chemistry, Physics, Microbiology, Weed Control, Field Crops	40-50	50-60
0104	Animal Husbandry	Lower	Chemical Analysis	30-40	60-80
		Lower	Feeding, Care, Meat Technology	40-80	80-160
		Upper	Breeding, Reproduction, Nutrition Endocrinology, Physiology	40-80	80-160
0105	Dairy Husbandry	Lower	Chemical Analysis	30-40	55-65
			Feeding, Milking Methods, Care	40-80	70-110
		Upper	Chemical Analysis, Nutrition Breeding, Physiology Lactation	50-60	70-80
0106	Poultry Husbandry	Lower	Genetics	30-40	55-65
		Upper	Nutrition, Physiology	40-50	60-70
0108	Horticulture	Lower	General, Lawn Management	30-40	45-55
		Upper	Flower Arrangement, Taxonomy, Germination & Propagation	40-50	60-70
0109	Ornamental Horticulture	Lower	---	30-40	45-55
		Upper	---	40-50	60-70
0114	Forestry	Upper	---	30-50	45-65
0117	Range Management	Upper	---	30-50	45-65

TABLE 3.35 (continued)

HEGIS DISCIPLINE					
CODE	DISCIPLINE SPECIALTY	COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
0200	Architecture and Environmental Design				
0202	Architecture	Lower	Elem. Design, Projection Drawing, Rendering	40-50	50-60
		Upper	Design	50-60	60-70
			Furniture Design, Interior	40-50	50-70
0204	Landscape Architecture	Upper	---	50-60	60-70
0206	Planning	Upper	---	50-60	60-70
0400	Biological Sciences				
0401	Biology, General	Lower	General	30-40	45-55
		Upper	General	30-40	45-55
		Grad.	General	40-60	60-80
0402	Botany	Lower	Elem., Plant Anatomy, Taxonomy	30-40	50-60
		Upper	Morphology, Mycology, Taxonomy Plant Physiology, Micro-technique	40-50	50-70
		Grad.	Pathology, Microtechnique	40-60	55-80
0403	Bacteriology	Upper	Serology, Virology, Pathogenic, Immunology, Hematology	40-50	60-70
		Grad	---	50-60	80-90
0406	Plant Pathology	Lower	Elementary, General	30-40	50-60
		Upper	Cytology, Morphology of Fungi, Mycology, Nematology	40-50	55-65
		Grad.	---	50-60	70-80

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
0407	Zoology	Lower	Intro, General, Comparative Anatomy, Physiology	30-40	55-65
		Upper	Vertebrate, Invertebrate, Cytology, Embryology, Enzymology, Parasitology, Histology, Morphology, Ornithography, Ecology Limnology, Taxonomy	40-50	60-70
		Grad.	---	50-60	70-80
0408	Pathology	Upper	Hematology, Infectious Diseases, Pathogenic, Pathological Anatomy	40-50	60-70
		Grad	---	50-60	70-80
0410	Physiology	Upper	Pharmacology, Chemical Physiology	40-50	55-65
		Upper	Experimental, Animal Physiology	50-60	80-90
0411	Microbiology	Upper	Dairy Microbiology, Bacterial Ecology, Pathogenic, Soil Microbiology	40-50	55-65
		Grad.	---	50-60	70-80
0412	Anatomy	Lower	Developmental Anatomy	30-40	45-55
		Lower	Gross Anatomy	50-60	60-80
		Upper	Microscopic Anatomy, Vertebrate Morphology	40-50	55-65
		Grad.	---	50-60	70-80
0413	Histology	Lower	Histology	30-40	45-55
		Upper	---	40-50	55-65
		Grad.	---	50-60	70-80
0414	Biochemistry	Upper	Physical Organic, Nutrition Enzymology	40-50	55-65
		Grad.	---	50-60	70-80

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
0415	Biophysics	Upper	Radiation Biology, Cellular Processes	40-50	55-65
		Grad.	---	50-60	70-80
0421	Entomology	Lower	Elementary, Introductory	30-40	45-55
		Upper	Physiology, Taxonomy Ecology, Limnology Toxicology, Morphology	40-50	55-65
		Grad.	---	50-60	70-80
0427	Genetics	Lower	Elementary	30-40	45-55
		Upper	Cytology, Cytogenetics, Microbial Genetics	40-50	55-65
		Grad.	---	50-60	70-80
0500	Business and Management				
0502	Accounting	Lower	General Accounting	25-30	30-35
		Upper	General Accounting	25-30	30-35
		Grad.	General Accounting	25-30	30-35
0506	Management	Upper	Time & Motion Analysis	30-40	35-40
0514	Commericial Practice, Secretarial Studies	Lower	Typewriter, Calculator	25-30	30-35
		Upper	Typewriter, Calculator	25-30	30-35
0700	Computer and Information Sciences				
0701	Computer Sciences	Upper	(Does not include machine area)	20-30	35-40
		Grad.		20-30	35-40

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
0900	Engineering				
0902	Aeronautical	Upper	---	100-150	130-180
0903	Agricultural	Upper	Soil & Water Engineering	50- 60	70- 80
		Upper	Electricity	40- 50	55- 65
		Upper	Farm Metal Work, Shop Work	100-120	120-140
		Upper	Structures	80-100	100-120
		Upper	Farm Machinery, Equipment	100-150	130-180
0906	Chemical Engineering	Upper	Unit Operations	100-150	130-180
		Upper	Chemical Processes	100-150	120-170
		Upper	Physical Chemistry	60-100	70-110
		Upper	Instrumentation	30- 40	40- 50
0907	Petroleum Engineering	Upper	Production	100-150	130-180
0908	Civil Engineering	Upper	Hydraulics, Concrete	80-100	100-120
		Upper	Soils	50- 60	65- 75
		Upper	Strength of Materials	100-150	130-180
		Upper	Photogrammetry	50- 60	70- 80
0909	Electrical	Upper	Circuits	60- 70	80- 90
		Upper	Machines, Power Engineering	80-100	100-120
		Upper	Measurements, Electronics, Control Systems	40- 50	55- 65
0910	Mechanical	Upper	Mechanical, Thermodynamics Manufacturing Processes	100-150	150-200
		Upper	Machine Shop, Machines	50- 60	65- 75

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
0912	Geophysical	Upper	Seismology	50- 60	65- 75
		Upper	Electricity, Magnetism, Electronics, Circuitry	50- 60	65- 75
		Upper	Prospecting Technology, Well Logging	80-100	100-120
0913	Industrial	Upper	Processes, Time and Motion	100-150	120-170
0914	Metallurgical	Upper	Microscopy	40- 50	55- 65
		Upper	Spectrography	100-150	130-180
		Upper	Physical Metallurgy	70- 80	90-100
0918	Mining	Upper	Unit Operations, Production	100-150	120-170
0919	Engineering Physics	Lower	---	30- 40	45- 55
		Upper	---	40- 50	55- 65
		Grad.	---	50- 60	70- 80
0999	Engineering Drawing, Graphics, Design	Lower	Drawing, Drafting	30- 40	45- 55
		Lower	Engineering Drawing	30- 40	45- 55
		Upper	Graphics, Design, Advanced Drafting	40- 50	55- 65
1000	Fine and Applied Arts				
1001	Fine Arts	Lower	Introductory, Drawing, Painting Materials, Techniques	30- 40	45- 55
		Upper	Advanced Painting	40- 60	55- 75
		Upper	Sculpture, Ceramics, Pottery, Crafts	50- 60	70- 80
		Grad.	Individual Studios	100-120	120-140

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
1004	Music	Lower	Individual Practice Rooms	40- 80	60- 90
		Upper	Group Practice	15- 20	20- 25
		Grad.			
1007	Drama	Lower Upper Grad.		100-150	150-200
1009	Commercial Arts	Lower	Intro. Advertising Design	30- 40	45- 55
		Upper	Adv. Advertising Design	40- 50	55- 65
1100	Foreign Languages				
1101	Language Laboratories	Lower Upper Grad.	Booth Recording Room and Control Station	30- 40	40- 50
1300	Home Economics				
1301	General Home Economics	Lower	---	30- 40	50- 60
		Upper	---	40- 50	60- 70
1303	Clothing & Textiles	Lower	Materials	30- 40	40- 50
		Lower	Textile Chemistry	40- 50	50- 60
		Upper	Patternmaking, Design, Costuming, Sewing	50- 60	60- 70
1306	Foods & Nutrition	Lower	Food Chemistry, Elem. Nutrition	30- 40	40- 50
		Upper	Nutrition	40- 50	55- 65
		Upper	Food Preparation and Analysis, Experimental Cookery	50- 60	70- 80
		Upper	Taste Panel	20- 25	30- 35

TABLE 3.35 (continued)

HEGIS DISCIPLINE					
CODE	DISCIPLINE SPECIALTY	COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
1600	Library Science				
1601	Library Science & Bibiliography	Upper	Library Methods	40- 50	55- 65
1700	Mathematics				
1702	Statistics	Lower	Elementary	20- 25	25- 30
		Upper	Intermediate, Advanced	25- 30	30- 35
1900	Physical Sciences				
1901	Physical Science	Lower	General Science Subjects	30- 40	40- 50
1902	Physics	Lower	General, Elementary Principles, Introductory	30- 40	40- 50
		Upper	Intermediate, Electronics, Heat, Mechanics, Optics, Modern Physics, Electricity	40- 50	55- 65
		Grad.	Atomic Physics	50- 60	70- 80
1905	Chemistry	Lower	General, Elementary	30- 40	45- 55
		Lower	Quantitative, Qualitative, Organic	40- 50	55- 65
		Upper	Adv. Organic, Qualitative Quantitative, Biochemistry	50- 60	70- 80
		Upper	Physical Chemistry	50- 60	70- 80
		Grad.	---	50- 60	70- 80
1911	Astronomy	Lower	---	25- 40	30- 50
		Upper	---	40- 50	55- 65
		Grad.	---	50- 60	70- 80

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	ALLOCATION FOR STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
1912	Astrophysics & Astrogeophysics*	Lower	---	30- 40	45- 55
		Upper	---	40- 50	50- 60
		Grad.	---	50- 60	70- 80
1913	Atmospheric Science	Lower	---	30- 40	40- 50
		Upper	---	40- 50	55- 65
		Grad.	---	50- 60	70- 80
1914	Geology	Lower	Elementary, General	30- 40	40- 50
		Upper	Mineralogy, Paleontology, Crystallography	40- 50	50- 60
		Upper	Stratigraphy, Petrology, Petrography, Mapping, Cartography, Lithology	50- 60	60- 70
		Grad.	---	50- 60	60- 70
2000	Psychology				
2001	Psychology	Lower	Experimental, Introductory	30- 40	40- 50
		Upper	Physiological Psychology	40- 50	50- 60
		Upper	Learning, Perception, Advanced Experimental	40- 50	50- 60
		Upper	Testing	40- 50	55- 65
		Grad.	---	50- 60	65- 75

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*Astrophysics and Astrogeophysics, though they have separate planning factors in the Heldman study, have been combined to coincide with the HEGIS taxonomy. The higher factors are displayed here.

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
2200	Social Sciences				
2202	Anthropology	Lower	Physical Anthropology	30- 40	40- 50
		Upper	Linguistics	30- 40	35- 45
		Upper	Advanced Physical Anthropology	40- 50	50- 60
2203	Archeology	Lower	Analysis of Archaeological Specimens	40- 50	50- 60
		Upper	---	50- 60	60- 70
2206	Geography	Lower	Physical Geography	40- 50	50- 60
		Upper	Cartography	50- 60	60- 70
2208	Sociology	Upper		30- 40	40- 50
5000	Business & Commerce Technologies				
5001	Business and Commerce Technologies, General	---	---	25- 35	30- 40
5002	Accounting Technologies	---	---	20- 25	25- 30
5003	Banking and Finance Technologies	---	---	20- 25	25- 30
5004	Marketing, Distribution, Business, Purchasing and Industrial Management Technologies	---	---	20- 25	25- 30
5005	Secretarial Technologies (includes office machine training)	---	---	35- 45	40- 50

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
5006	Personal Service Technologies	---	---	35- 45	40- 50
5007	Photography Technologies	---	---	50- 60	55- 65
5008	Communications and Broadcasting Technologies	---	---	40- 50	45- 55
5009	Printing and Lithography Technologies	---	---	40- 60	50- 70
5010	Hotel and Restaurant Management Technologies	---	---	40- 50	45- 55
5011	Transportation and Public Utility Technologies	---	---	120-180	140-200
5012	Applied Arts, Graphic Arts, and Fine Arts Technologies	---	---	50-100	60-110
5100	Data Processing Technologies				
5101	Data Processing Technologies, General	---	---	70- 80	75- 85
5102	Keypunch and Input Preparation Technologies	---	---	40- 50	50- 60

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES OF LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
5103	Computer Programmer Technologies	---	---	75- 80	80- 85
5104	Computer Operator Technologies	---	---	75- 80	80- 85
5105	Data Processing Equipment Maintenance Technologies	---	---	60- 65	65- 70
5200	Health Services and Paramedical Technologies				
5201	Health Services Technologies, General	---	---	40- 50	45- 55
5202	Dental Assistant Technologies	---	---	35- 40	40- 50
5203	Dental Hygiene Technologies	---	---	60- 70	70- 80
5204	Dental Laboratory Technologies	---	---	40- 50	45- 55
5205	Medical or Biological Laboratory Assistant Technologies	---	---	40- 50	45- 55
5207	Radiologic Technologies	---	---	40- 50	45- 55
5208	Nursing	---	---	40- 50	45- 55

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
5210	Occupational Therapy Technologies	---	---	30- 40	35- 45
5211	Surgical Technologies	---	---	40- 50	45- 55
5212	Optical Technologies	---	---	40- 50	45- 55
5213	Medical Record Technologies	---	---	35- 40	40- 45
5214	Medical Assistant and Medical Office Assistant Technologies	---	---	35- 40	40- 45
5215	Inhalation Therapy Technologies	---	---	45- 50	50- 55
5216	Psychiatric Technologies	---	---	30- 35	35- 40
5217	Electro-Diagnostic Technologies	---	---	45- 50	50- 55
5218	Institutional Management Technologies	---	---	30- 35	35- 40
5219	Physical Therapy Technologies	---	---	90-100	100-110

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
5300	Mechanical and Engineering Technologies				
5301	Mechanical and Engineering Technologies	---	---	120-130	
5302	Aeronautical and Aviation Technologies	---	---	150-160	
5303	Engineering Graphics	---	---	50- 60	
5304	Architectural Drafting Technologies	---	---	60- 65	
5305	Chemical Technologies	---	---	100-120	
5306	Automotive Technologies	---	---	150-160	
5307	Diesel Technologies	---	---	100-120	
5308	Welding Technologies	---	---	140-150	
5309	Civil Technologies	---	---	110-120	
5310	Electronics Technologies	---	---	60- 70	
5311	Electromechanical Technologies	---	---	100-120	
5312	Industrial Technologies	---	---	150-160	
5313	Textile Technologies	---	---	100-120	

TABLE 3.35 (continued)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
5314	Instrumentation Technologies	---	---	150-160	
5315	Mechanical Technologies	---	---	150-160	
5316	Nuclear Technologies	---	---	140-150	
5317	Construction & Building Technologies	---	---	150-160	
5400	Natural Science Technologies				
5401	Natural Science Technologies, General	---	---	50- 60	55- 65
5402	Agriculture Technologies	---	---	60- 65	65- 70
5403	Forestry and Wildlife Technologies	---	---	45- 50	50- 55
5404	Food Service Technologies	---	---	45- 50	50- 55
5405	Home Economics Technologies	---	---	55- 60	60- 65
5406	Marine and Oceanographic Technologies	---	---	45- 50	50- 55
5407	Laboratory Technologies General	---	---	45- 50	50- 55
5408	Sanitation and Public Health Technologies	---	---	60- 65	65- 70

TABLE 3.35 (conclusion)

HEGIS DISCIPLINE		COURSE LEVEL	SPECIFIC COURSES BY LEVEL	UNIT FLOOR AREA ALLOCATION PER STUDENT STATION ASF/STUDENT STATION	TOTAL UNIT FLOOR AREA ALLOCATION PER STUDENT STATION INCLUDING SERVICE ASF/STUDENT STATION
CODE	DISCIPLINE SPECIALTY				
5500	Public Service Related Technologies				
5501	Public Service Technologies, General	---	---	30-35	35-40
5502	Bible Study or Religion Related Occupations	---	---	30-35	35-40
5503	Education Technologies	---	---	30-35	35-40
5504	Library Assistant Technologies	---	---	30-35	35-40
5505	Police, Law Enforcement Corrections Technologies	---	---	30-35	35-40
5506	Recreation and Social Work Related Technologies	---	---	30-35	35-40
5507	Fire Control Technology	---	---	30-35	35-40
5508	Public Administration and Management Technologies	---	---	30-35	35-40

SPECIAL CLASS LABORATORY AND INDIVIDUAL STUDY LABORATORY

ROOM TYPES INCLUDED:

Rooms which in terms of their physical characteristics resemble class laboratories but which are called Special Class Laboratories because a large portion of their use is scheduled on an informal ("drop in," or "first come first served") basis. Typical (but not necessarily nor exclusively) included are group tutorial rooms, language laboratories, group music practice rooms, group studios, etc.

Also included are rooms equipped and designed for individual student experimentation, observation, or practice in a particular academic speciality. Station in these rooms may be multiple (as in auto-tutorial laboratory) or single (as in a music practice room).

DISCUSSION:

Because special class laboratories and individual study laboratories are scheduled informally (or partially on a formal basis, but primarily on a informal basis), the program data (weekly room-hours and weekly student-hours) typical of classrooms and class laboratories are not so readily determined. To the extent such facilities are scheduled, data may be available. However, for the informally scheduled and "drop-in" use of such facilities, reasonable estimates of weekly room-hours and weekly student-hours must be determined. Given such a determination the analysis of the capacity of existing rooms and the projection of required rooms can be made on the same bases outlined in Section 3.1 through 3.3 in this manual.

SEPARATE CLASS LABORATORY ESSAY

The number of stations (N) required may be evaluated or projected in two ways:

- Method A - As a function of weekly student-hours (WSH) divided by ~~a station-utilization~~ rate (SUR).
- Method B - As a function of average section size ($\overline{SS}$) divided by a station occupancy ratio (SOR) multiplied by the number of rooms (R).

These two procedures are mathematically equivalent:

METHOD A

$$N = \frac{(WSH)}{(SUR)}$$

Because

$$SUR = (RUR) \times (SOR)$$

Then

$$N = \frac{(WSH)}{(RUR) \times (SOR)}$$

Because

$$RUR = \frac{(WRH)}{(R)}$$

Then

$$N = \frac{(WSH)}{(WRH/R) \times (SOR)}$$

Or

$$N = \frac{(WSH)}{(WRH)} \times \frac{(R)}{(SOR)}$$

Because

$$\overline{SS} = \frac{(WSH)}{(WRH)}$$

Then

$$N = (\overline{SS}) \times \frac{(R)}{(SOR)}$$

Or

$$N = \frac{(\overline{SS})}{(SOR)} \times (R)$$

METHOD B

$$N = \frac{(\overline{SS})}{(SOR)} \times (R)$$

Because

$$\overline{SS} = (WSH)/(WRH)$$

Then

$$N = \frac{(WSH)/(WRH)}{(SOR)} \times (R)$$

Because

$$SOR = (SUR)/(RUR)$$

Or

$$SOR = (SUR)/\frac{(WRH)}{(R)}$$

Then

$$N = \frac{(WSH)/(WRH)}{(SUR)/(WRH/R)} \times (R)$$

By simplification

$$N = \frac{(WSH)}{(SUR)}$$

In the practical application of these two methods, different numerical results may be obtained depending upon the sequence of the calculations.

Consider the following example:

For a given biology specialty, these projected numbers and assumptions are available:

Weekly Student Hours (WSH) = 1760

Weekly Room Hours (WRH) = 80

Average Section Size ($\overline{SS}$) = 22

Room Utilization Rate (RUR) = 22

Station Occupancy Ratio (SOR) = .80

Station Utilization Rate (SUR) = 17.6

In Method A the number of stations required is:

$$N = \frac{(WSH)}{(SUR)}$$

$$= \frac{(1760)}{(17.6)}$$

$$= 100 \text{ stations}$$

and the number of rooms is:

$$R = \frac{(WRH)}{(RUR)}$$

$$= \frac{(80)}{(20)}$$

$$= 3.6363+$$

$$= 4 \text{ rooms}$$

Hence, this method indicates the need for 4 rooms and 100 stations. If, however, the average number of stations per room, 25, is checked against the assumed station-occupancy ratio, we find that:

$$\begin{aligned} SOR &= (\overline{SS})/(N/R) \\ &= (22)/25) \\ &= .88 \end{aligned}$$

which is higher than the .80 which was initially assumed. Moreover, the actual room utilization is less than the assumed 22 hours per week:

$$\begin{aligned} RUR &= (WRH)/(R) \\ &= (80)/(4) \\ &= 20 \end{aligned}$$

However, if the rooms are used to full extent of the room utilization rate, then the average section size will be reduced to 20, because 88 weekly room-hours will be available:

$$\begin{aligned} WRH &= \frac{(WRH)}{(R)} \times (R) \\ &= (22) \times (4) \\ &= 88 \text{ weekly room hours} \end{aligned}$$

and

$$\begin{aligned} \overline{SS} &= \frac{(WSH)}{(WRH)} \\ &= \frac{(1760)}{(88)} \\ &= 20 \text{ average section size} \end{aligned}$$

With the reduction of the section size to 20, the station-occupancy ratio of .80 is again possible.

$$\begin{aligned} SOR &= (\overline{SS})/(N/R) \\ &= (20)/(25) \\ &= .80 \end{aligned}$$

The reason for this variation is occasioned by the necessity of building 4 rooms rather than 3.6363+ rooms. If it were possible to provide that fractional number of rooms, then no difference would result.

$$\begin{aligned} SOR &= (\overline{SS})/(N/R) \\ &= (22)/\frac{(100)}{(3.6363+)} \\ &= .80 \end{aligned}$$

Because a whole number of rooms must be built, one of three decisions must be made, given 4 rooms with a total of 100 stations:

- If the station-utilization rate is the important criterion then there will be:

  SUR = 17.6 SUR = 17.6

  RUR = 20 OR RUR = 22

  SOR = .88 SOR = .80

  $\overline{SS}$ = 22 $\overline{SS}$ = 20

- If the room-utilization rate is the important criterion, then there will be:

  RUR = 22

  SOR = .80

  $\overline{SS}$ = 20

- If the station-occupancy ratio is the important criterion, then there will be:

  SOR = .80

  RUR = 20

  $\overline{SS}$ = 22

Method B assumes that the average section size is the important criterion. Assuming the same values used in the Method A, the number of stations required increases to:

$$N = \frac{(\overline{SS})}{(SOR)} \times (R)$$

$$= \frac{(22)}{(.80)} \times (4)$$

$$= (27.5) \times (4)$$

$$= 110 \text{ stations}$$

Again, it is the necessity of rounding the required number of rooms to a whole number which causes the number of stations required to be increased from 100 (in Method A) to 110 (in Method B), because mathematically:

$$\begin{aligned} N &= \frac{(SS)}{(SOR)} \times (R) \\ &= \frac{(22)}{(80)} \times (3.6363+) \\ &= (27.5) \times (3.5353+) \\ &= 100 \text{ stations} \end{aligned}$$

If the decision is reached to provide 110 stations, then

$$\begin{aligned} SOR &= (SS)/(N/R) \\ &= (22)/(110/4) \\ &= (22)/(27.5) \\ &= .80 \end{aligned}$$

but

$$\begin{aligned} RUR &= (WRH)/(WRH/R) \\ &= (80)/(4) \\ &= 20 \end{aligned}$$

Thus, the assumed room-utilization ratio of 22 hours per week cannot be attained if the average section size and station-occupancy ratio are held firm.

In order to attain the assumed room-utilization rate of 22 hours per week, average section size would need to be reduced to 20. This would have the effect of reducing the station-occupancy ratio to:

$$\begin{aligned} SOR &= \frac{(SS)}{(N/R)} \\ &= \frac{(20)}{(27.5)} \\ &= (.73+) \end{aligned}$$

In practice neither Method A nor Method B can satisfy all of the original assumptions, because fractional parts of rooms are impossible. The choice between the two methods depends upon the relative importance of the basic assumptions. Both methods permit attainment of the assumed room-utilization rate if average section size can be reduced. In Method A this can be accomplished with fewer stations at the assumed station-occupancy ratio; in Method B this can be accomplished with more stations but a lower station-occupancy ratio. On the other hand, if the average section size cannot be reduced, then the assumed room-utilization rate cannot be attained in either Method A or B. Both methods permit the attainment of the station-occupancy ratio if the room-utilization rate can be attained either by reducing section size or by increasing the station-occupancy ratio while reducing the room-utilization rate. The assumed station-utilization rate cannot be attained in Method B.

2.0 Offices – Office Related Facilities

Manual Three

INTRODUCTION TO MANUAL THREE

OFFICE AND RESEARCH FACILITIES

Manual Three of the Space Analysis Manuals includes facilities evaluation and projection procedures for two kinds of space:

1. Office Related Facilities
2. Research Facilities

These two rather different kinds of institutional space were grouped together for many reasons, primary among which is the fact that in some disciplines, in some institutions, research and office spaces are co-extensive. Moreover, may public institutions and higher education agencies use one planning factor to project facilities requirements for both kinds of space (lumped together).

Manual Three is formulated in much the same way as the other SAM manuals. Integral to each section is an explanation of the evaluation or projection procedure - called the DISCUSSION, which is followed by an appropriate illustration of the procedures - called an EXAMPLE. Although each of the procedures is thoroughly explained and illustrated, it is not intended that they will be the "answer to a maiden's prayers" as far as institutional analysis is concerned. Office facilities, as well as research facilities, are unique, difficult to manage, evaluate, and project even under the most ideal of circumstances. Individual institutional differences also have an effect. Nevertheless, the procedures and techniques presented and illustrated on the following pages constitute the core of a valid process, to which must be added the unique elements of the institution or agency which is using them.

OFFICE-OFFICE RELATED FACILITIES

ROOM TYPES INCLUDED:

Offices, studios (art, music, etc.) serving as offices, office service rooms, conference rooms, and conference service rooms.

DISCUSSION:

The evaluation and projection of the need for office and conference facilities is based primarily on counting numbers of persons. For the most part, the persons who are counted are faculty and other staff employed by the institution. In some instances, numbers of students and certain groups of the public-at-large are also relevant to the office or conference room requirements of a college or university.

An office station is usually assigned to each staff member who requires one and that station typically is assigned for his exclusive use. A few exceptions to this generalization may occur in the case of part-time employees or in institutional units working on a shift basis. Conference rooms also tend to be assigned for the exclusive use of a department, although some sharing may occur. For these reasons, the utilization concepts applied to classrooms are wholly inappropriate for offices and conference rooms.

The provision of the right number of offices in the right location at any point in time is one of the more difficult problems in space management. Staff members tend to be added to institutional units in small increments. However, buildings usually do not permit the addition of similarly small increments, particularly in the location where it is most needed -- adjacent to the cohorts of the new staff members. A few institutions have obviated this problem by assigning faculty office space on a more or less random basis. In general, however, institutions still attempt to house the staff members of one department in close proximity to each other. The procedures and examples developed here are based on the assumption that members of the same department (or at least of the same broad program area) should be grouped together.

The amount of office space assigned to a staff member is a function of at least four considerations:

- Degree of privacy - A one-station office usually requires more assignable square feet per station that a multiple-station office. The difference is primarily a function of the use of the internal circulation space within the office. (Exceptions to this generalization may occur in offices with extensive record storage facilities but with relatively few occupants.)

- Staff level - Most institutions provide differential office sizes based upon position. For example, the president may have a larger office than a dean, who has a larger office than a departmental chairman, who has a larger office than a faculty member, who has a larger office than a teaching assistant. Moreover, a few institutions attempt to provide increasingly larger offices within four or five major faculty ranks (from instructor through professor). Within the clerical ranks there are levels of assignable square-feet-per-station differences frequently showing some correlation with the space allowed the "boss."

- Discipline sector and function - In some discipline sectors the type of room known as an office also serves, in part, what is known in other discipline sectors as a non-class laboratory. The function being served in both instances is usually called research. For example, a chemistry professor may be assigned both an office and a non-class laboratory. (Although instruction and research may take place in both the office and the non-class lab, there is a tendency to associate the office with instructional functions and the non-class laboratory with research functions.) In certain discipline categories, in some institutions, it is assumed that the space comparable to the non-class laboratory space is to be included in the room called an office. On this basis, office sizes for faculty members vary according to discipline categories. For example, a history professor may have a larger office than a chemistry professor because the history professor's "non-class laboratory space" (in the form of an extensive library) is included in his office, not in a separate room. In many institutions a single number of assignable square feet per FTE faculty member is used as a standard. The "research space" required by social scientists and humanists in such institutions may be provided then in other spaces such as the library or "research laboratories." Occasionally, when the provision of "non-class laboratory space is provided within the "office", the facility is given a special name such as a studio (in art or music).

- Historical accident/Lesser of two evils - Many times it is necessary to use rooms as offices which were not originally designed for that purpose. Rooms in old residence halls are a classic example. Often such rooms are larger than the application of institutional criteria for offices requires or allows. If the principle of privacy is deemed to be of greater importance than amount of assignable square feet per person, then, in such cases, apparent excesses of assignable square feet per occupant will result.

DISCUSSION

DETAILED METHOD

EVALUATION OF EXISTING OFFICE-OFFICE RELATED ROOM CAPACITY

DATA TO BE DETERMINED:

Offices

- The number of persons by discipline sector and/or department* who can be housed in existing office facilities.
- The adequacy of the amount of existing office-service facilities.

Conference Rooms

- The number of discipline sectors and/or departments which can be served adequately by existing conference room facilities.
- The adequacy of the amount of existing conference room service facilities.

PROGRAM DATA REQUIRED:

Offices

- Number of people who require office space
  - by discipline sector and/or department and
  - by size of work-station required

distributed according to

- degree of privacy required

and adjusted for

- "multi-shift" use.

Conference Rooms

- Designation of discipline sector and/or departments which require conference room space

---

*Not all institutions are organized on a departmental basis. The word "department" is used to connote the organizational structure of the institution, whatever it may be.

  - by number of conferees

distributed according to

  - degree of exclusive use.

FACILITIES DATA REQUIRED:

These data on existing offices, conference rooms, and related service areas:

Offices

- Number of offices, by discipline sector and/or department
- Number of stations in each office
- Assignable square feet in each office
- Assignable square feet in office service areas, by discipline sector and/or department.

Conference Rooms

- Number of conference rooms (by discipline sector and/or department)
- Number of stations in each conference room
- Assignable square feet in each conference room
- Assignable square feet in conference service areas, by discipline sector and/or department.

ADDITIONAL FACILITIES DATA:

Because the evaluation process involves an assessment of the capability of rooms to accommodate more stations (or the advisability of reducing the number of stations), it would be useful to have dimensioned floor plans of each room available.

UTILIZATION ASSUMPTIONS REQUIRED:

Offices

- Assignable square feet per office station
  - by discipline sector and/or department and
  - by type of work station required.

- Assignable square feet of office service space
  - by discipline sector and/or department
  - by extent of (record/office supply) storage

Conference Rooms

- Assignable square feet per conference room station, by discipline sector and/or department
- Assignable square feet of conference room service space per conference room, by discipline sector and/or department
- Degree of shared use of conference room by two or more departments.

PROCEDURE:

1. Obtain from the facilities inventory these data on existing offices, conference rooms and related service areas:

Offices

- Number of offices, by discipline sector and/or department
- Number of stations in each office
- Assignable square feet in each office
- Assignable square feet in office service areas, by discipline sector and/or department

Conference Rooms

- Number of conference rooms by discipline sector and/or department
- Number of stations in each conference room
- Assignable square feet in each conference room
- Assignable square feet in conference service areas, by discipline sector and/or department.

2. Obtain the program data:

Offices

- Number of people who require office space
    - by discipline sector and/or department and
    - by size of work-station required

distributed according to

- degree of privacy required

and adjusted for

- "multi-shift" use

Conference Rooms

- Designation of discipline sectors and/or departments which require conference room space
- by number of conferees

distributed according to

- degree of exclusive use

3. Compare the existing program requirements with the available facilities for offices, conference rooms, and related service areas.

COMMENTS ON THE PROCEDURE

The procedure for evaluating the current use and capacities of office facilities depends heavily on institutional policy and administrative judgments. Two factors in particular influence the judgmental considerations:

First is the assumption that office space will be assigned in such a way as to maintain physical proximity for the staff of each department. This objective often creates a situation in which staff needs and facilities availability are not well matched; either more space is assigned originally than is called for by institutional policy, or too little space is available after a few years of operation. Office location is a matter of such importance that the evaluation must be based on conditions at the departmental rather than the institutional level.

Second, architectural considerations heavily influence the utilization of office facilities. Offices usually are provided as rooms, not as a specific number of assignable square feet. If the rooms available are larger than called for in an institution's policy statement, the evaluation must recognize the situation. The assignment process involves allocating specific rooms to specific individuals. The evaluation process calls for examination of the results of the assignment process and for making judgments within the context of existing physical plant.

EXAMPLE

DETAILED METHOD

EVALUATION OF EXISTING OFFICE-OFFICE RELATED ROOM CAPACITY

DATA TO BE DETERMINED:

Offices

- The number of persons by discipline sector and/or department who can be housed in existing office facilities.

- The adequacy of the amount of existing office-service facilities.

Conference Rooms

- The number of discipline sectors and/or departments which can be served adequately by existing conference room facilities.

- The adequacy of the amount of existing conference room service facilities.

PROCEDURE:

1. Obtain from the facilities inventory these data on existing offices, conference rooms and related service areas:

Offices

- Number of offices, by discipline sectors and/or department

- Number of stations in each office

- Assignable square feet in each office

- Assignable square feet in office service areas, by discipline sectors and/or department

TABLE 2.1

FACILITIES INVENTORY DATA FOR OFFICES

Department	Number of Offices	Station In Each Office	Assignable Square Feet In Each Office	Assignable Square Feet In Office Service
1. Biological Sciences	1	1	128	22
	1/2	1	70	
2. Biology	4	1	110	94
	1	1	119	
	1/2	1	79	
	1/2	1	61	
3. Zoology	2	1	110	66
	2	1	121	
	1/2	1	80	
	1/2	1	62	
4. Math and Physical Sciences	1	1	191	25
	1/2	1	69	
5. Mathematics	4	1	100	70
	1	2	160	
	1	1	98	
	1/2	1	70	
	1	1	80	
6. Chemistry	2	2	223	56
	1	2	204	
	1	1	120	
	1	1	126	
7. Geology	2	1	95	40
	1	1	143	
8. Physics	2	2	192	72
	2	1	118	
	1/2	1	68	
	1/2	1	65	
9. Humanities	1	1	154	40
	1/2	1	74	
10. English	4	1	121	102
	3	2	157	
	1	1	100	
	1	2	128	
11. Fine Arts	3	1	208	98
	8	1	122	
	2	1	147	
	1	2	217	

TABLE 2.1 (Continued)

Department	Number of Offices	Station In Each Office	Assignable Square Feet In Each Office	Assignable Square Feet In Office Service
12. Philosophy	6	1	111	86
	1	2	181	
	1	1	100	
	1/2	1	78	
13. Classics	1	1	155	10
14. Languages	3	1	112	96
	7	1	144	
	1/2	1	65	
	1	2	311	
15. Social Sciences	1	1	124	47
	1/2	1	78	
16. Political Science	6	1	102	100
	1	2	180	
	1	1	95	
	1	1	131	
17. History	3	2	200	106
	4	1	104	
	1	1	90	
	1	1	139	
18. Economics	4	1	103	62
	1	1	110	
	1	1	119	
19. Sociology	5	1	103	54
	1/2	1	79	
20. Business	1	1	103	108
	4	1	95	
	5	1	93	
	1	2	196	
21. Education	1	1	106	76
	1	1	107	
	4	1	102	
	1	2	130	
22. Physical Education	1	1	128	84
	4	1	145	
	1	2	180	
	1	1	104	
ACADEMIC SUB TOTALS	142	162	17,560	1 514
1. President	1	1	265	45
	1	1	110	
	1	1	120	
2. Academic Vice President	1	1	120	16
	1	1	90	
3. Administrative Vice President	1	1	158	32
	2	1	110	
	1	2	176	

TABLE 2.1 (Conclusion)

Department	Number of Offices	Station In Each Office	Assignable Square Feet In Each Office	Assignable Square Feet In Office Service
4. Business Vice President	1	1	154	36
	2	1	120	
5. Student Affairs Vice President	1	1	143	18
	1	2	182	
6. Dean of the Graduate School	1	1	126	18
	1	2	182	
7. Dean of Students	1	1	135	10
	1	1	86	
8. Admissions	1	1	100	110
	1	2	92	
9. Registrar	2	1	106	88
	1	3	187	
10. Budget	1	1	37	46
	1	1	122	
11. Business	1	2	178	46
	1	2	181	
12. Purchasing	1	1	92	46
	1	2	194	
13. Public Information	1	1	138	22
	1	1	102	
14. Publications	1	1	121	82
	1	1	104	
15. Auxiliary	4	1	131	56
	7	1	102	
16. Physical Plant	3	1	110	66
	1	4	320	
NON-ACADEMIC SUBTOTALS	48	60	6,356	737
TOTALS	190	222	23,916	2,251

Conference Rooms

- Number of conference rooms by discipline sector and/or department
- Number of stations in each conference room
- Assignable square feet in each conference room
- Assignable square feet in conference service areas, by discipline sector and/or department.

TABLE 2.2

FACILITIES INVENTORY DATA FOR CONFERENCE ROOMS

Department	Number of Conference Rooms	Stations in each Conference Room	Assignable Square Feet in each Conference Room	Assignable Square Feet in Conference Room Service
1. Biological Sciences, Biology, Zoology, Math and Physical Sciences, Math., Chemistry, Geology, Physics	1	15	225	0
2. Languages, Humanities, English, Fine Arts, Philosophy, Classics	1	15	353	22
3. Social Sciences, Political Science, History, Economics, Sociology	1	20	270	30
4. Business, Education	1	15	360	15
5. Physical Education	1	15	340	35
Academic Subtotal	5	80	1,548	102
6. Board of Directors Room	1	25	600	25
7. Non-Academic Departments	1	10	100	20
Non-Academic Subtotal	2	35	700	45
TOTALS	7	115	2,248	147

2. Obtain the program data:

Offices

- Number of people who require office space
  - by discipline sector and/or department and
  - by size of work station required

distributed according to

- degree of privacy required

and adjusted for

- "multi-shift" use

Conference Rooms

- Designation of discipline sector and/or departments which require conference room space
- by number of conferees

distributed according to

- degree of exclusive use

TABLE 2.3
PERSONNEL REQUIRING OFFICE FACILITIES

DEPARTMENTS	ADMINISTRATORS		PROFESSIONALS		GRAD. ASST.	SUPPORT	
	SINGLE	DOUBLE	SINGLE	DOUBLE	DOUBLE	SINGLE	DOUBLE
1. Biological Sciences	1	-	-	-	-	-	1
2. Biology	-	-	5	-	1	-	1
3. Zoology	-	-	4	-	1	-	-
4. Math. & Phys. Sciences	1	-	-	-	-	-	1
5. Mathematics	-	-	5	2	1	1	-
6. Chemistry	-	-	2	4	1	1	-
7. Geology	-	-	3	-	-	-	-
8. Physics	-	-	2	4	1	-	1
9. Humanities	1	-	-	-	-	-	1
10. English	-	-	5	6	-	-	1
11. Fine Arts	-	-	5	6	-	-	2
12. Philosophy	-	-	7	2	-	1	-
13. Classics	-	-	1	-	-	-	-
14. Languages	1	-	5	4	1	-	2
15. Social Sciences	1	-	-	-	-	-	1
16. Political Science	-	-	5	4	-	-	1
17. History	-	-	5	6	-	1	-
18. Economics	-	-	2	4	-	-	-
19. Sociology	-	-	3	2	-	-	1
20. Business	1	-	3	6	-	1	-
21. Education	1	-	4	2	-	1	-
22. Physical Education	-	-	2	4	-	-	-
NON ACADEMIC SUBTOTAL	7	-	68	56	6	6	13
1. President	1	-	1	-	-	1	-
2. Academic V.P.	1	-	-	-	-	2	-
3. Administrative V.P.	.5	-	1	-	-	-	2
4. Business V.P.	1	-	-	-	-	-	2
5. Student Affairs V.P.	1	-	-	-	-	-	2
6. Dean-Grad. School	.5	-	-	-	-	-	2
7. Dean of Students	1	-	-	-	-	1	-
8. Admissions	-	-	1	-	-	1	2
9. Registrar	-	-	2	-	-	2	2
10. Budget	-	-	1	-	-	1	-
11. Business	-	-	-	2	-	-	2
12. Purchasing	-	-	1	-	-	-	2
13. Public Information	-	-	1	-	-	1	-
14. Publications	-	-	1	-	-	1	-
15. Auxiliary	-	-	4	-	-	7	-
16. Physical Plant	1	-	1	2	-	-	4
NON-ACADEMIC SUBTOTALS	7	0	14	4	0	17	20
TOTALS	14	0	82	60	6	23	33

TABLE 2.4

PROGRAM DATA CONCERNING CONFERENCE NEEDS

DEPARTMENTS REQUIRING CONF. SPACE	NUMBER OF CONFEREES
1. Biological Sciences, Biology, Zoology	14
2. Math & Physical Sciences, Mathematics, Chemistry, Geology, Physics	30
3. Languages, Humanities, English, Fine Arts, Philosophy, Classics	38
4. Social Sciences, Political Science, History, Economics, Sociology	36
5. Business, Education	19
6. Physical Education	6
7. Board of Directors	25
8. Non-Academic Departments	15 (maximum)

3. Compare the existing program requirements with the available facilities for offices, conference rooms and related service areas.

TABLE 2.5

COMPARISON OF OFFICE INVENTORY AND PROGRAM DATA

ADMINISTRATORS

Department	Personnel Requiring Space by Type		Offices Available			Difference
	Single	Double	Number	Capacity	Assignable Square Feet	
1. Biological Sciences	1	-	1	1	128	-
4. Math. & Physical Sci.	1	-	1	1	191	-
9. Humanities	1	-	1	1	154	-
14. Languages	1	-	1	1	144	-
15. Social Sciences	1	-	1	1	124	-
20. Business	1	-	1	1	103	-
21. Education	1	-	1	1	107	-
22. Physical Education	-	-	1	1	145	+1
ACADEMIC SUBTOTALS	7	0	8	8	1096	+1
1. President	1	-	1	1	265	-
2. Academic V.P.	1	-	1	1	120	-
3. Administrative V.P.	5	-	1	1	158	-
4. Business V.P.	1	-	1	1	154	-
5. Student Affairs V.P.	1	-	1	1	143	-
6. Dean-Grad. School	.5	-	1	1	126	-
7. Dean of Students	1	-	1	1	135	-
16. Physical Plant	1	-	1	1	110	-
NON-ACADEMIC SUBTOTALS	7	-	8	8	1211	+1
TOTALS	14	-	16	16	2307	+2

TABLE 2.6

COMPARISON OF OFFICE INVENTORY AND PROGRAM DATA

PROFESSIONALS

Department	Personnel Requiring Space by Type		Offices Available			Difference
	Single	Double	Number	Capacity	Assignable Square Feet	
2. Biology	4	-	4	1	110	-
	1	-	1	1	119	-
3. Zoology	2	-	2	1	110	-
	2	-	2	1	121	-
5. Mathematics	-	2	1	2	160	-
	4	-	4	1	100	-
	1	-	1	1	98	-
6. Chemistry	-	4	2	2	223	-
	1	-	1	1	120	-
	1	-	1	1	126	-
7. Geology	2	-	2	1	95	-
	1	-	1	1	143	-
8. Physics	-	4	2	2	192	-
	2	-	2	1	118	-
10. English	4	-	4	1	121	-
	-	6	3	2	157	-
	1	-	1	1	100	-
11. Fine Arts	3	-	3	1	208	-
	-	6	6	1	122	-
	1	-	1	1	122	-
	1	-	1	1	122	-
	-	-	2	1	147	+2
12. Philosophy	6	-	6	1	111	-
	1	-	1	1	100	-
	-	2	1	2	181	-

TABLE 2.6 (Continued)

Department	Personnel Requiring Space by Type		Offices Available			Difference
	Single	Double	Number	Capacity	Assignable Square Feet	
13. Classics	1	-	1	1	155	-
14. Languages	5	1	6	1	144	-
	-	3	3	1	112	-
16. Political Science	5	1	6	1	102	-
	-	1	1	1	95	-
	-	2	1	2	180	-
17. History	-	6	3	2	200	-
	4	-	4	1	104	-
	1	-	1	1	139	-
18. Economics	2	2	4	1	103	-
	-	1	1	1	110	-
	-	1	1	1	119	-
19. Sociology	3	2	5	1	103	-
20. Business	-	5	5	1	93	-
	-	1	1	1	95	-
	3	-	3	1	95	-
21. Education	4	-	4	1	102	-
	-	2	1	2	130	-
22. Physical Education	1	2	3	1	145	-
	-	2	1	2	180	-
	1	-	1	1	104	-
	-	-	1	1	128	+1
ACADEMIC SUBTOTALS	68	56	112	127	14003	+3

TABLE 2.6 (Conclusion)

Department	Personnel Requiring Space by Type		Offices Available			Difference
	Single	Double	Number	Capacity	Assignable Square Feet	
1. President	1	-	1	1	120	-
3. Administrative V.P.	1	-	2	1	110	+1
8. Admissions	1	-	1	1	100	-
9. Registrar	2	-	2	1	106	-
10. Budget	1	-	1	1	137	-
11. Business	-	2	1	2	178	-
12. Purchasing	1	-	1	1	92	-
13. Public Information	1	-	1	1	138	-
14. Publications	1	-	1	1	121	-
15. Auxiliary	4	-	4	1	131	-
16. Physical Plant	1	2	2	1	110	-1
NON-ACADEMIC SUBTOTALS	14	4	17	18	2062	-
TOTALS	82	60	129	145	16065	+3

TABLE 2.7

COMPARISON OF OFFICE INVENTORY AND PROGRAM DATA

GRADUATE ASSISTANTS

	Personnel Requiring Space by Type		Offices Available			
Department	Single	Double	Number	Capacity	Assignable* Square Feet	Difference
2. Biology	-	1	½	1	79^c	-
3. Zoology	-	1	½	1	80^c	-
5. Mathematics	-	1	½	1	70^d	-
6. Chemistry	-	1	½	1	102^e	-
8. Physics	-	1	½	1	68^d	-
14. Languages	-	1	½	1	65^g	-
ACADEMIC SUBTOTALS	-	6	3	6	464	-
TOTALS	-	6	3	6	464	-

*Alphabetic characters indicate shared space. Some of these facilities for graduate students are shared with support staff. Superscripted identical alphabetic characters represent spaces in the same office. 79^c and 80^c are in the same office.

TABLE 2.8

COMPARISON OF OFFICE INVENTORY AND PROGRAM DATA

SUPPORT

Department	Personnel Requiring Space by Type		Offices Available			Difference
	Single	Double	Number	Capacity	Assignable* Square Feet	
1. Biological Sciences	-	1	½	1	70[a]	-
2. Biology	-	1	½	1	61[b]	-
3. Zoology	-	-	½	1	62[b]	+1
4. Math. & Physical Sci.	-	1	½	1	69[a]	-
5. Mathematics	1	-	1	1	80	-
6. Chemistry	1	-	½	1	102[e]	-
8. Physics	-	1	½	1	65[g]	-
9. Humanities	-	1	½	1	76[f]	-
10. English	-	1	1	2	128	+1
11. Fine Arts	-	2	1	2	217	-
12. Philosophy	1	-	½	1	78[g]	-
14. Languages	-	2	1	2	311	-
15. Social Sciences	-	1	½	1	76[f]	-
16. Political Science	-	1	1	1	131	-
17. History	1	-	1	1	90	-
19. Sociology	-	1	½	1	79[g]	-
20. Business	1	-	1	1	196	-
21. Education	1	-	1	1	106	-
ACADEMIC SUBTOTALS	6	13	13	21	1997	+2

*Alphabetic characters indicate shared space. Some of these facilities for graduate students are shared with support staff. Superscripted identical alphabetic characters represent spaces in the same office. 79[c] and 80[c] are in the same office.

TABLE 2.8 (Conclusion)

Department	Personnel Requiring Space by Type		Offices Available			Difference
	Single	Double	Number	Capacity	Assignable* Square Feet	
1. President	1	-	1	1	110	-
2. Academic V.P.	2	-	1	2	90	-
3. Administrative V.P.	-	2	1	2	176	-
4. Business V.P.	-	2	2	1	120	-
5. Student Affairs V.P.	-	2	1	2	182	-
6. Dean-Grad. School	-	2	1	2	182	-
7. Dean of Students	1	-	1	1	86	-
8. Admissions	-	2	1	2	92	-
	1	-	-	-	-	-1
9. Registrar	2	2	1	3	187	-1
10. Budget	1	-	1	1	122	-
11. Business	-	2	1	2	181	-
12. Purchasing	-	2	1	2	194	-
13. Public Information	1	-	1	1	103	-
14. Publications	1	-	1	1	104	-
15. Auxiliary	7	-	7	1	102	0
16. Physical Plant	-	4	1	4	320	-
NON-ACADEMIC SUBTOTALS	17	20	23	35	3083	-2
TOTALS	23	33	36	56	5038	0

*Alpha characters indicate shared space. Some of these facilities for support personnel are shared with graduate students. Superscripted, identical alphabetic characters represent spaces in the same office. 70^a and 69^a are in the same office.

TABLE 2.9

COMPARISON OF OFFICE SERVICE, CONFERENCE ROOM, AND CONFERENCE ROOM SERVICE INVENTORY AND PROGRAM DATA

DEPARTMENT	OFFICE SERVICE			CONFERENCE			CONFERENCE SERVICE		
	ASF Inventory	ASF (1) Program	ASF Diff.	ASF Inventory	ASF (2) Program	ASF Diff.	ASF Inventory	ASF (3) Program	ASF Diff.
1. Biological Sci.	22	40	18	255	255	0	0	22	22
2. Biology	94	140	46						
3. Zoology	66	121	55						
4. Math & Phys. Sci.	25	52	27		650	650		65	65
5. Mathematics	70	162	92						
6. Chemistry	56	179	123						
7. Geology	40	67	27						
8. Physics	72	151	79						
9. Humanities	40	46	6	353	680	327	22	68	46
10. English	102	237	135						
11. Fine Arts	98	422	324						
12. Philosophy	86	205	119						
13. Classics	10	31	21						
14. Languages	96	344	248						
15. Social Sciences	47	40	(-7)	270	675	405	30	68	38
16. Political Science	100	204	104						
17. History	106	249	143						
18. Economics	62	128	66						
19. Sociology	54	119	65						
20. Business	108	229	121	360	360	0	15	36	21
21. Education	76	150	74						
22. Physical Education	84	198	114	340	340	0	35	35	0
ACADEMIC SUBTOTAL	1514	3514	2000	1548	2930	1382	102	294	192

TABLE 2.9 (Conclusion)

DEPARTMENT	OFFICE SERVICE			CONFERENCE			CONFERENCE SERVICE		
	ASF Inventory	ASF (1) Program	ASF Diff.	ASF Inventory	ASF (2) Program	ASF Diff.	ASF Inventory	ASF (3) Program	ASF Diff.
1. President	45	371	326						
2. Academic V.P.	16	158	142						
3. Administrative V.P.	32	416	384						
4. Business V.P.	36	296	260						
5. Student Affiars V.P.	18	244	226	600	600	0	25	60	35
6. Dean-Grad. School	18	231	213						
7. Dean of Students	10	166	156	100	225		20	22	2
8. Admissions	110	144	34						
9. Registrar	88	299	211						
10. Budget	46	194	148						
11. Business	46	269	223						
12. Purchasing	46	215	169						
13. Public Information	22	181	159						
14. Publications	82	169	76						
15. Auxiliary	56	928	872						
16. Physical Plant	66	488	422						
NON ACADEMIC SUBTOTAL	737	4769	4032	700	825	125	45	82	37
TOTAL	2251	8283	6032	2248	3755	1507	147	376	229

(1) Program data determined on the basis of:
    a) Office Service Space = 20% of Office Space for Academic Departments
    b) Office Service Space = 75% of Office Space for Non-Academic Departments

(2) Program data determined on the basis of 25 ASF for 75% of conferees or 225 ASF, whichever is greater, unless existing conference space was adequate.

(3) Program data determined on the basis of 10% of conference space.

DISCUSSION

DETAILED METHOD

PROJECTION OF OFFICE-OFFICE RELATED ROOM REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

Offices

- number of offices by discipline sector and/or department,*
- number of stations in each office,
- assignable square feet in each office, and
- assignable square feet in office service areas by discipline sector and/or department.

Conference Rooms

- number of conference rooms by discipline sector and/or department,
- number of stations in each conference room,
- assignable square feet in each conference room, and
- assignable square feet in conference room service areas by discipline sector and/or department.

PROGRAM DATA REQUIRED:

Offices

- Number of people who require office space
  - by discipline sector and/or department and
  - by size of work-station required

  distributed according to

  - degree of privacy required

  and adjusted for

  - "multi-shift" use.

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*Not all institutions are organized on a departmental basis. The word "department" is used to connote the organizational structure of the institution, whatever it may be.

Conference Rooms

- Designation of discipline sectors and/or departments which require conference room space
  - by number of conferees

  distributed according to
  - degree of exclusive use.

FACILITIES DATA REQUIRED:

None

UTILIZATION ASSUMPTIONS REQUIRED:

Offices

- Assignable square feet per office station
  - by discipline sector and/or department and
  - by type of work-station required.
- Assignable square feet of office service space
  - by discipline sector and/or department and
  - by extent of (record/office supply) storage.

Conference Rooms

- Assignable square feet per conference room station by discipline sector and/or department,
- assignable square feet of conference room service space per conference room by discipline sector and/or department and
- degree of shared use of conference room by two or more departments.

PROCEDURE:

1. Develop the program data for offices, conference rooms, and their related spaces:

   Offices - The number of persons who require office space is the required statistic. In many institutions, that number is not readily available. The traditional institutional records which contain information on number of persons (such as payroll or personnel office files) usually do not carry any indication concerning office requirements. It is necessary, therefore, from a variety of sources, to develop the number of persons who require office space -- a statistic peculiar to the determination of physical facility requirements and not easily derived from other (staff) data in an institutional management information system.

Moreover, it is also necessary to identify the persons who require office space at least by discipline sector and/or by department. These data must be organized at least by discipline sector, because in some instances the facilities' office data must be aggregated with other facilities' data within that discipline sector before calculating further (facilities) data in that discipline sector. In other instances, proration of the office space to two or more functional categories may be necessary; such prorations usually have differential factors associated with the service discipline sectors. In larger institutions where departments or their equivalents exist, it usually is desirable to organize the number-of-persons-requiring-office-space data according to the organizational structure of the institution.

It is also necessary to identify the persons who require office space by the size of work station required. These data typically are inferred from the titles (and departmental assignments) associated with the persons who require office space. For example, the amount of office space to be provided may be different for staff of faculty rank than for teaching assistants; or an executive secretary may require more space than a clerk in a clerical pool.

The degree of privacy required is another characteristic which must be determined for persons requiring office space. This information is necessary for two reasons. First, the amount of space per person usually is less in a multiple-person office than in a private office. Second, in existing institutions instances occur where faculty (or other staff) are housed in offices larger in area than would result from the normal application of institutional office-space criteria. Such situations result from a complex set of interacting factors such as historical accident, old buildings, "departmental integrity"*, unavailability of other offices of appropriate size, and so on. In the final analysis, however, they occur because the principle of privacy for the person housed in such an over-sized office is considered to be more important than the typically assumed square-feet-per-person for staff members of that particular category.

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*"Departmental integrity" is used here to mean the practice of housing the staff members in one department in reasonably close proximity to each other.

In most instances an office station is assigned to one person. Some institutional operations, however, are on a shift basis, so that one office station can serve more than one person requiring office space. Certain offices in the library and many offices in plant maintenance and protection are typical examples.

Where this occurs the number of office stations is not equal to the number of people requiring office space, but some lesser number, depending on the degree of multiple use of the same office station.

Conference Rooms - The designation of discipline sector and/or departments which require conference room space may or may not be stated explicitly as part of the program data which is available. If it is not indicated explicitly, then some working guidelines must be developed. Usually it is assumed that each organizational unit at least should have access to a conference room.

The number of stations in a conference room relates directly to the number of persons it is designed to serve. For example, a conference room designed for the Biology Department normally has stations equal to, or slightly greater than, the number of staff in that department. In other instances, particularly for conference rooms at the administrative level, the number of stations is based upon the number of staff who are members of the committees which the conference room will serve. Other conference rooms (sometimes classified under other room types) used for continuing education programs, public service or extension conferences, and so on, are considered as special cases; the number of stations in such conference rooms are a function of the conferences attracted by the educational program, rather than of the staff responsible for the program.

The degree of exclusive use of conference rooms is a matter of institutional decision. It is not unusual for each academic department to have its own conference room. On the other hand, with a minimum of scheduling effort, but some occasional conflicts of interest, it is possible for one conference room to serve two or more organizational units.

2. Determine the assignable square feet (ASF) criteria:

   Offices

   - ASF per person who requires office space
     - by discipline sector and/or department and
     - by size of work-station required.
   - basic number of ASF of office service area required, plus per-person (or per record) increments above the base number by discipline sector and/or department.

   Conference Rooms

   - ASF per station in conference rooms by discipline sector and/or department.
   - *Ad hoc* determinations of conference-room-service area.

3. Calculate the office, conference room, and related space requirements.

   Offices

   - Calculate the number of offices required by discipline sector and/or department by number of stations and by assignable square feet in each office.
   - Calculate the number of ASF of office service area required.

   Conference Rooms

   - Determine the number of conference rooms required by discipline sector and/or department by number of stations and by assignable square feet in each conference room.
   - Determine the number of assignable square feet (ASF) of conference room service space required.

EXAMPLE

DETAILED METHOD

PROJECTION OF OFFICE-OFFICE RELATED ROOM REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

Offices

- Number of offices by discipline sector and or department
- Number of stations in each office
- Assignable square feet in each office
- Assignable square feet in office service areas by discipline sector and/or department

Conference Rooms

- Number of conference rooms by discipline sector and/or department
- Number of stations in each conference room
- Assignable square feet in each conference room
- Assignable square feet in conference room service areas by discipline sector and/or department

PROCEDURE:

1. Develop the program data for offices, conference rooms, and their related spaces:

TABLE 2.10

PROGRAM DATA FOR OFFICES IN A NEW INSTITUTION

DEPARTMENT	FTE ADMINISTRATORS		FTE PROFESSIONALS		FTE GRAD. ASST.	FTE SUPPORT	
	SINGLE	DOUBLE	SINGLE	DOUBLE	DOUBLE	SINGLE	DOUBLE
1. Biological Sciences	1.0	--	--	--	--	1.0	--
2. Biology	---	--	5.0	2.0	1.0	--	2.0
3. Zoology	---	--	2.0	2.5	1.0	--	1.0
4. Math & Phys. Sciences	1.0	--	--	--	--	1.0	--
5. Mathematics	---	--	5.0	4.5	1.0	--	1.5
6. Chemistry	---	--	2.0	4.5	1.5	--	2.0
7. Geology	---	--	2.0	2.5	0.5	--	2.0
8. Physics	---	--	3.0	4.0	1.5	1.0	2.0
9. Humanities	1.0	--	--	--	--	1.0	--
10. English	--	--	6.0	8.5	--	--	2.0
11. Fine Arts	--	--	10.0	12.0	--	1.0	2.5
12. Philosophy	--	--	7.0	5.0	--	--	2.0
13. Classics	--	--	1.0	1.0	--	--	0.5
14. Languages	1.0	--	6.0	6.0	2.0	1.0	1.5
15. Social Sciences	1.0	--	--	--	--	1.0	0.5
16. Political Science	---	--	5.0	6.5	--	--	1.5
17. History	---	--	6.0	7.5	0.5	--	2.0
18. Economics	---	--	4.0	4.0	--	--	0.5
19. Sociology	---	--	2.0	4.5	--	1.0	--
20. Business	1.0	--	5.0	6.0	--	--	2.0
21. Education	1.0	--	3.0	4.0	--	--	1.5
22. Physical Education	1.0	--	3.0	6.0	--	--	2.0
ACADEMIC SUBTOTAL	8.0	--	77.0	91.0	9.0	8.0	29.0
1. President	1.0	--	1.0	--	--	1.0	1.0
2. Academic V.P.	1.0	--	--	--	--	1.0	1.0
3. Administrative V.P.	1.0	--	1.0	--	--	1.0	2.0
4. Business V.P.	1.0	--	1.0	--	--	--	2.0
5. Student Affairs V.P.	1.0	--	--	--	--	--	2.0
6. Dean - Grad. School	1.0	--	--	--	--	--	2.0
7. Dean of Students	2.0	--	--	--	--	1.0	--
8. Admissions	--	--	2.0	--	--	1.0	2.0
9. Registrar	--	--	2.0	--	--	1.0	3.0
10. Budget	--	--	2.0	--	--	1.0	1.0
11. Business	--	--	2.0	--	--	1.0	2.5
12. Purchasing	--	--	1.0	--	--	--	3.5
13. Public Information	--	--	--	2.0	--	1.0	--
14. Publications	--	--	1.0	--	--	--	2.0
15. Auxiliary	--	--	1.0	4.0	--	1.0	8.0
16. Physical Plant	1.0	--	1.0	2.0	--	1.0	4.0
NON-ACADEMIC SUBTOTAL	9.0	--	15.0	8.0	--	11.0	36.0
TOTAL	17.0	--	92.0	99.0	9.0	19.0	65.0

TABLE 2.11
PROGRAM DATA FOR CONFERENCE ROOMS IN A NEW INSTITUTION

DEPARTMENTS	TOTAL FTE IN DEPTS.	SIZE OF LARGEST DEPT.	STATIONS REQUIRED
1. Biological Sciences, Biology, Zoology	19.5 FTE	10.0 FTE	15 Stations
2. Math & Physical Sciences, Mathematics, Chemistry	23.0	12.0	15
3. Geology, Physics	18.5	11.5	15
4. Humanities, English, Classics	21.0	16.5	15
5. Fine Arts, Philosophy	39.5	25.5	25
6. Languages	17.5	17.5	15
7. Social Sciences, Political Science, History	31.5	16.0	20
8. Economics, Sociology	16.0	8.5	10
9. Business, Education	23.5	14.0	15
10. Physical Education	12.0	12.0	10
ACADEMIC SUBTOTAL	222.0 FTE	----	155 Stations 10 Rooms
1. Board of Directors	-----	----	25 Stations
2. Other Non-Academic Depts.	79	14 FTE	15 Stations 10 Stations
NON-ACADEMIC SUBTOTAL	79 FTE	----	50 Stations 3 Rooms
TOTAL	301 FTE	----	205 Stations 13 Rooms

2. Determine the assignable square feet (ASF) criteria:

Offices

- ASF per person who requires office space
    - by discipline sector and/or department and
    - by size of work-station required.
- basic number of ASF of office service area required, plus per-person (or per-record) increments above the base number, by discipline sector and/or department.

TABLE 2.12

OFFICE SPACE ASSIGNABLE SQUARE FEET CRITERIA*

Departments	Assignable Square Feet Per Station						
	FTE ADMINISTRATOR		FTE PROFESSIONAL		FTE GRAD. STU.	FTE SUPPORT	
	Single	Double	Single	Double	Double	Single	Double
Acad.-All	160 $\frac{\text{ASF}}{\text{Station}}$	100 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$
President	300 $\frac{\text{ASF}}{\text{Station}}$	---	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$
Dean of Grad School	200 $\frac{\text{ASF}}{\text{Station}}$	---	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$
All Others	160 $\frac{\text{ASF}}{\text{Station}}$	100 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$

*Illustrative only - not suggested as standards.

TABLE 2.13

OFFICE SERVICE SPACE ASSIGNABLE SQUARE FEET CRITERIA*

DEPARTMENTS BY SIZE	SERVICE SPACE AS A PERCENTAGE OF OFFICE SPACE IN A DEPARTMENT
1. Academic Departments	
a. 0 - 4 Work Stations	46%
b. 5 - 19 "	20%
c. 20 - 29 "	19%
d. 30 - 49 "	18%
2. Non-Academic Departments	
a. 0 - 4 Work Stations	76%
b. 5 - 29 "	50%
c. Over 30 "	32%

*Illustrative only - not suggested as standards

Conference Rooms

•ASF per station in conference rooms by discipline sector and/or department

•*Ad hoc* determinations of conference room service area

TABLE 2.14

CONFERENCE ROOM ASSIGNABLE SQUARE FEET CRITERIA*

CONFERENCE ROOM ASSIGNABLE SQUARE FEET STATION		CONFERENCE ROOM SERVICE SPACE AS A PERCENTAGE OF CONFERENCE ROOM AREA
STATIONS	FACTOR	PERCENTAGE
10	25	10%
15	22	10%
20	20	8%
25	20	7%
30	15	5%

*Illustrative only - not suggested as standards

3. Calculate the office, conference room and related space requirements.

Offices

- Calculate the number of offices required by discipline sector and/or department by number of stations and by assignable square feet in each office.

- Calculate the number of ASF of office service area required.

TABLE 2.15

OFFICE REQUIRED BY NUMBER OF STATIONS,

NUMBER OF ASSIGNABLE SQUARE FEET, AND DEPARTMENT FOR A NEW INSTITUTION

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
1. Biological Sciences	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
2. Biology	Professionals	SINGLE	5.0	5	5	120	600
	"	DOUBLE	2.0	2	1	80	160
	Grad. Ass't.	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	2.0	2	1	90	180
3. Zoology	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	2.5	3	1.5	80	240
	Grad. Ass't.	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	1.0	1	.5	90	90
4. Math & Physical Sciences	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
5. Mathematics	Professionals	SINGLE	5.0	5	5	120	600
	"	DOUBLE	4.5	5	2.5	80	400
	Grad. Ass't.	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	1.5	2	1	90	180
6. Chemistry	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	4.5	5	2.5	80	400
	Grad. Ass't.	DOUBLE	1.5	2	1	80	160
	Support	DOUBLE	2.0	2	1	90	180

TABLE 2.15 (continued)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
7. Geology	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	2.5	3	1.5	80	240
	Grad. Ass't.	DOUBLE	0.5	1	.5	80	80
	Support	DOUBLE	2.0	2	1	90	180
8. Physics	Professionals	SINGLE	3.0	3	3	120	360
	"	DOUBLE	4.0	4	2	80	320
	Grad. Ass't.	DOUBLE	1.5	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	90	180
9. Humanities	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
10. English	Professionals	SINGLE	6.0	6	6	120	720
	"	DOUBLE	8.5	9	4.5	80	720
	Support	DOUBLE	2.0	2	1	90	180
11. Fine Arts	Professional	SINGLE	10.0	10	10	120	1200
	"	DOUBLE	12.0	12	6	80	960
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.5	3	1.5	90	270
12. Philosophy	Professional	SINGLE	7.0	7	7	120	840
	"	DOUBLE	5.0	5	2.5	80	200
	Support	DOUBLE	2.0	2	1	90	180
13. Classics	Professional	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	.5	1	.5	90	90
14. Languages	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	6.0	6	6	120	720
	"	DOUBLE	6.0	6	3	80	480
	Grad. Ass't.	DOUBLE	2.0	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	.5	2	1	90	180
15. Social Sciences	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	.5	1	.5	90	90
16. Political Science	Professional	SINGLE	5.0	5	5	120	600
	"	DOUBLE	6.5	7	3.5	80	560
	Support	DOUBLE	1.5	2	1	90	180

TABLE 2.15 (continued)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
17. History	Professionals	SINGLE	6.0	6	6	120	720
	"	DOUBLE	7.5	8	4	80	640
	Grad. Ass't.	DOUBLE	0.5	1	.5	80	80
	Support	DOUBLE	2.0	2	1	90	180
18. Economics	Professionals	SINGLE	4.0	4	4	120	480
	"	DOUBLE	4.0	4	2	80	320
	Support	DOUBLE	0.5	1	.5	90	90
19. Sociology	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	4.5	5	2.5	80	400
	Support	SINGLE	1.0	1	1	120	120
20. Business	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	5.0	5	5	120	600
	"	DOUBLE	6.0	6	3	80	480
	Support	DOUBLE	2.0	2	1	90	180
21. Education	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	3.0	3	3	120	360
	"	DOUBLE	4.0	4	2	80	320
	Support	DOUBLE	1.5	2	1	90	180
22. Physical Education	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	3.0	3	3	120	360
	"	DOUBLE	6.0	6	3	80	480
	Support	DOUBLE	2.0	2	1	90	180
ACADEMIC SUBTOTALS			222.0	232	162.5		22,730
1. President	Administrator	SINGLE	1.0	1	1	300	300
	Professional	SINGLE	1.0	1	1	120	120
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	90	90
2. Academic V.P.	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	90	90
3. Administrative V.P.	Administrator	SINGLE	1.0	1	1	160	160
	Professional	SINGLE	1.0	1	1	120	120
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	90	180

TABLE 2.15 (continued)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = 7
4. Business V.P.	Administrator	SINGLE	1.0	1	1	160	160
	Professional	SINGLE	1.0	1	1	120	120
	Support	DOUBLE	2.0	2	1	90	180
5. Student Affairs V.P.	Administrator	SINGLE	1.0	1	1	160	160
	Support	DOUBLE	2.0	2	1	90	180
6. Dean - Graduate School	Administrator	SINGLE	1.0	1	1	200	200
	Support	DOUBLE	2.0	2	1	90	180
7. Dean of Students	Administrator	SINGLE	2.0	2	2	160	320
	Support	SINGLE	1.0	1	1	120	120
8. Admissions	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	90	180
9. Registrar	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	3.0	3	1.5	90	270
10. Budget	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	90	90
11. Business	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.5	3	1.5	90	270
12. Purchasing	Professional	SINGLE	1.0	1	1	120	120
	Support	DOUBLE	3.5	4	2	90	360
13. Public Information	Professional	DOUBLE	2.0	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
14. Publications	Professional	SINGLE	1.0	1	1	120	120
	Support	DOUBLE	2.0	2	1	90	180
15. Auxiliary	Professional	SINGLE	1.0	1	1	120	120
	"	DOUBLE	4.0	4	2	80	320
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	8.0	8	4	90	720

TABLE 2.15 (Conclusion)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
16. Physical Plant	Administrator	SINGLE	1.0	1	1	160	160
	Professional	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	4.0	4	2	90	360
NON-ACADEMIC SUBTOTALS		---	79.0	80	57.5	---	8,710
TOTALS		---	301.0	312	220.0	---	31,440

TABLE 2.16

OFFICE SERVICE SPACE REQUIRED BY DEPARTMENT FOR A NEW INSTITUTION

DEPARTMENTS	ASSIGNABLE SQUARE FEET OF OFFICE SPACE (1)	WORK STATIONS (2)	SERVICE SPACE FACTOR (3)	SERVICE SPACE (1) x (3) = 4
1. Biological Sciences	280	2	46%	129
2. Biology	1,020	10	20%	204
3. Zoology	650	7	20%	130
4. Mathematics & Physical Sciences	280	2	46%	129
5. Mathematics	1,260	13	20%	252
6. Chemistry	980	11	20%	196
7. Geology	740	8	20%	158
8. Physics	1,140	12	20%	228
9. Humanities	280	2	46%	129
10. English	1,620	17	20%	324
11. Fine Arts	2,550	26	19%	484
12. Philosophy	1,220	14	20%	244
13. Classics	290	3	46%	133
14. Languages	1,820	18	20%	364
15. Social Sciences	370	3	46%	170
16. Political Science	1,340	14	20%	268
17. History	1,620	17	20%	324
18. Economics	890	9	20%	178
19. Sociology	760	8	20%	152
20. Business	1,420	14	20%	284
21. Education	1,020	10	20%	204
22. Physical Education	1,180	12	20%	236
ACADEMIC SUBTOTALS	22,730 ASF	232 Stations	--	4,920 ASF
1. President	630	4	76%	479
2. Academic Vice President	370	3	76%	281
3. Administrative V.P.	580	5	50%	290
4. Business V.P.	460	4	76%	350
5. Student Affairs	340	3	76%	258
6. Dean - Graduate School	380	3	76%	289
7. Dean of Students	440	3	76%	334
8. Admissions	540	5	50%	270

TABLE 2.16 (Conclusion)

DEPARTMENTS	ASSIGNABLE SQUARE FEET OF OFFICE SPACE (1)	WORK STATIONS (2)	SERVICE SPACE FACTOR (3)	SERVICE SPACE (1) x (3) = 4
9. Registrar	630	6	50%	315
10. Budget	450	4	76%	342
11. Business	530	6	50%	315
12. Purchasing	480	5	50%	240
13. Public Information	280	3	76%	213
14. Publications	300	3	76%	228
15. Auxiliary	1,280	14	50%	640
16. Physical Plant	920	9	50%	460
NON-ACADEMIC SUBTOTALS	8,710 ASF	80 Stations	---	5,304 ASF
TOTALS	31,440 ASF	312 Stations	---	10, 224 ASF

Conference Rooms

- Determine the number of conference rooms required by discipline sector and/or department by number of stations and by assignable square feet in each conference room.
- Determine the number of ASF of conference room service space required.

TABLE 2.17

CONFERENCE ROOMS AND CONFERENCE ROOM SERVICE BY DEPARTMENTS FOR A NEW INSTITUTION

Departments	Total FTE	Stations Required	ASF/Station Factor	Conference Room ASF	Conference Service Factor	Conference Service ASF
1. Biological Sciences, Biology, Zoology	19.5	15	22	330	10%	33
2. Math. & Physical Sciences, Mathematics Chemistry	23.0	15	22	330	10%	33
3. Geology, Physics	18.5	15	22	330	10%	33
4. Humanities, English, Classics	21.0	15	22	330	10%	33
5. Fine Arts, Philosophy	39.5	25	20	400	8%	32
6. Languages	17.5	15	22	330	10%	33
7. Social Sciences, Political Science, History	31.5	20	20	400	8%	32
8. Economics, Sociology	16.0	10	25	250	10%	25
9. Business, Education	23.5	15	22	330	10%	33
10. Physical Education	120	10	25	250	10%	25
Academic Subtotal	222.0 FTE	155 Stations 10 Rooms	--	3330 ASF	---	312 ASF

TABLE 2.17 (Conclusion)

Departments	Total FTE	Stations Required	ASF/Station Factor	Conference Room ASF	Conference Service Factor	Conference Service ASF
1. Board of Directors		25	20	400	8%	32
2. Other Non-Academic Departments	79	15 10	22 25	330 250	10% 10%	33 25
Non-Academic Subtotal	79 FTE	55 Stations 3 Rooms	--	980 ASF	--	90 ASF
Total	301 FTE	210 Stations 13 Rooms	--	4310 ASF	--	402 ASF

DISCUSSION

DETAILED METHOD

PROJECTION OF OFFICE-OFFICE RELATED ROOM REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

Offices

- Number of additional offices by discipline sector and/or department
- Number of stations in each additional office
- Assignable square feet in each additional office
- Assignable square feet in additional office service areas, by discipline sector and/or department

Conference Rooms

- Number of additional conference rooms by discipline sector and/or department
- Number of stations in each additional conference room
- Assignable square feet in each additional conference room
- Assignable square feet in additional conference room service areas by discipline sector and/or department

PROGRAM DATA REQUIRED:

Offices

- Number of people who require office space
  - by discipline sector and/or department and
  - by size of work-station required

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*Not all institutions are organized on a departmental basis. The word "department" is used to connote the organizational structure of the institution, whatever it may be.

distributed according to

- degree of privacy required

and adjusted for

- "multi-shift" use

Conference Rooms

- Designation of discipline sector and/or departments which require conference room space.
- by number of conferees

distributed according to

- degree of exclusive use

FACILITIES DATA REQUIRED:

These data on offices, conference rooms, and related service areas:

Offices

- Number of offices by discipline sector and/or department
- Number of stations in each office
- Assignable square feet in each office
- Assignable square feet in office service areas by discipline sector and/or department

Conference Rooms

- Number of conference rooms by discipline sector and/or department
- Number of stations in each conference room
- Assignable square feet in each conference room
- Assignable square feet in conference service areas by discipline sector and/or department

UTILIZATION ASSUMPTIONS REQUIRED

Offices

- Assignable square feet per office station
  - by discipline sector and/or department and
  - by type of work-station required
- Assignable square feet of office service space
  - by discipline sector and/or department and
  - by extent of (record/office supply) storage

Conference Rooms

- Assignable square feet per conference room station by discipline sector and/or department
- Assignable square feet of conference room service space per conference room by discipline sector and/or department
- Degree of shared use of conference rooms by two or more departments

PROCEDURE

1. Develop the program data for offices, conference rooms, and their related spaces:

   Offices - The number of persons who require office space is the required statistic. In many institutions, that number is not readily available. The traditional institutional records which contain information on number of persons (such as payroll or personnel office files) usually do not carry any indication concerning office requirements. It is necessary, therefore, from a variety of sources, to develop the number of persons who require office space--a statistic peculiar to the determination of physical facility requirements and not easily derived from other (staff) data in an institutional management information system.

Moreover, it is also necessary to identify the persons who require office space at least by discipline sector and/or by department. These data must be organized at least by discipline sector, because in some instances the office facilities data must be aggregated with other facilities data within that discipline sector before calculating further (facilities) data in that discipline sector. In other instances, proration of the office space to two or more functional categories may be necessary; such prorations usually have differential factors associated with the service discipline sector. In larger institutions where departments or their equivalents exist, it usually is desirable to organize the number-of-persons-requiring-office-space data according to the organizational structure of the institution.

It is also necessary to identify the persons who require office space by the size of work station required. These data typically are inferred from the titles (and departmental assignments) associated with the persons who require office space. For example, the amount of office space to be provided may be different for staff of faculty rank than for teaching assistants; or an executive secretary may require more space than a clerk in a clerical pool.

The degree of privacy required is another characteristic which must be determined for persons requiring office space. This information is necessary for two reasons. First, the amount of space per person usually is less in a multiple-person office than in a private office. Second, in existing institutions instances occur where faculty (or other staff) are housed in offices larger in area than would result from the normal application of institutional office-space criteria. Such situations result from a complex set of interacting factors such as historical accident, old buildings, "departmental integrity"*, unavailability of other offices of appropriate size, and so on. In the final analysis, however, they occur because the principle of privacy for the person housed in such an over-sized office is considered to be more important than the typically assumed square-feet-per-person for staff members of that particular category.

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*"Departmental integrity" is used here to mean the practice of housing the staff members in one department in reasonable close proximity to each other.

In most instances an office station is assigned to one person. Some institutional operations, however, are on a shift basis, so that one office station can serve more than one person requiring office space. Certain offices in the library and many offices in plant maintenance and protection are typical examples.

Where this occurs the number of office stations is not equal to the number of persons requiring office space, but some lesser number. depending on the degree of mutliple use of the same office station.

Conference Rooms - The designation of discipline sectors and/or departments which require conference room space may or may not be stated explicitly as part of the program data which is available. If it is not indicated explicitly, then some working guidelines must be developed. Usually it is assumed that each organizational unit at least should have access to a conference room.

The number of stations in a conference room relates directly to the number of persons it is designed to serve. For example, a conference room designed for the Biology Department normally has stations equal to, or slightly greater than, the number of staff in that department. In other instances, particularly for conference rooms at the administrative level, the number of stations is based upon the number of staff who are members of the committees which the conference room will serve. Other conference rooms (sometimes classified under other room types) used for continuing education programs, public service or extension conferences, and so on, are considered as special cases; the number of stations in such conference rooms are a function of the conferences attracted by the educational program, rather than of the staff responsible for the program.

The degree of exclusive use of conference rooms is a matter of institutional decision. It is not unusual for each academic department to have its own conference room. On the other hand, with a minimum of scheduling effort, but some occasional conflicts of interest, it is possible for one conference room to serve two or more organizational units.

2. Determine the assignable square feet (ASF) criteria:

Offices

- ASF per person who requires office space
  - by discipline sector and/or department and
  - by size of work-station required.

- basic number of ASF of office service area required, plus per-person (or per-record) increments above the base number by discipline sector and/or department.

Conference Rooms

- ASF per station in conference rooms by discipline sector and/or department

- *Ad hoc* determinations of conference-room-service area

3. Calculate the office, conference room, and related space requirements.

Offices

- Calculate the number of offices required by discipline sector and/or department by number of stations and by assignable square feet in each office.

- Calculate the number of ASF of office service area required.

Conference Rooms

- Determine the number of conference rooms required by discipline sector and/or department by number of stations and by assignable square feet in each conference room.

- Determine the number of ASF of conference room service space is required.

4. Compare the inventory of existing facilities by discipline sector and/or department with the projected office and conference room requirements.

5. Determine:

Offices

- The number of additional offices by discipline sector and/or department

- The number of stations in each additional office

- The assignable square feet in each additional office

- The assignable square feet in additional office service areas by discipline sector and/or department

Conference Rooms

- The number of additional conference rooms by discipline sector and/or department
- The number of stations in each additional conference room
- The assignable square feet in each additional conference room
- The assignable square feet in additional conference room service areas by discipline sector and/or department

EXAMPLE

DETAILED METHOD

PROJECTION OF OFFICE-OFFICE RELATED ROOM REQUIREMENTS FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

Offices

- •Number of offices by discipline sector and/or department
- •Number of stations in each office
- •Assignable square feet in each office
- •Assignable square feet in office service areas by discipline sector and/or department

Conference Rooms

- •Number of conference rooms by discipline sector and/or department
- •Number of stations in each conference room
- •Assignable square feet in each conference room
- •Assignable square feet in conference room service areas by discipline sector and/or department

PROCEDURE:

1. Develop the program data for offices, conference rooms, and their related spaces:

TABLE 2.18

PROGRAM DATA FOR OFFICES IN AN EXISTING INSTITUTION

DEPARTMENT	FTE ADMINISTRATORS		FTE PROFESSIONALS		FTE GRAD. ASST.	FTE SUPPORT	
	SINGLE	DOUBLE	SINGLE	DOUBLE	DOUBLE	SINGLE	DOUBLE
1. Biological Sciences	1.0	--	--	--	--	1.0	--
2. Biology	---	--	5.0	2.0	1.0	--	2.0
3. Zoology	---	--	2.0	2.5	1.0	--	1.0
4. Math & Phys. Sciences	1.0	--	--	--	--	1.0	--
5. Mathematics	---	--	5.0	4.5	1.0	--	1.5
6. Chemistry	---	--	2.0	4.5	1.5	--	2.0
7. Geology	---	--	2.0	2.5	0.5	--	2.0
8. Physics	---	--	3.0	4.0	1.5	1.0	2.0
9. Humanities	1.0	--	--	--	--	1.0	--
10. English	--	--	6.0	8.5	--	--	2.0
11. Fine Arts	--	--	10.0	12.0	--	1.0	2.5
12. Philosophy	--	--	7.0	5.0	--	--	2.0
13. Classics	--	--	1.0	1.0	--	--	0.5
14. Languages	1.0	--	6.0	6.0	2.0	1.0	1.5
15. Social Sciences	1.0	--	--	--	--	1.0	0.5
15. Political Science	---	--	5.0	6.5	--	--	1.5
17. History	---	--	6.0	7.5	0.5	--	2.0
18. Economics	---	--	4.0	4.0	--	--	0.5
19. Sociology	---	--	2.0	4.5	--	1.0	--
20. Business	1.0	--	5.0	6.0	--	--	2.0
21. Education	1.0	--	3.0	4.0	--	--	1.5
22. Physical Education	1.0	--	3.0	6.0	--	--	2.0
ACADEMIC SUBTOTAL	8.0	--	77.0	91.0	9.0	8.0	29.0
1. President	1.0	--	1.0	--	--	1.0	1.0
2. Academic V.P.	1.0	--	--	--	--	1.0	1.0
3. Administrative V.P.	1.0	--	1.0	--	--	1.0	2.0
4. Business V.P.	1.0	--	1.0	--	--	--	2.0
5. Student Affairs V.P.	1.0	--	--	--	--	--	2.0
6. Dean - Grad. School	1.0	--	--	--	--	--	2.0
7. Dean of Students	2.0	--	--	--	--	1.0	--
8. Admissions	--	--	2.0	--	--	1.0	2.0
9. Registrar	--	--	2.0	--	--	1.0	3.0
10. Budget	--	--	2.0	--	--	1.0	1.0
11. Business	--	--	2.0	--	--	1.0	2.5
12. Purchasing	--	--	1.0	--	--	--	3.5
13. Public Information	--	--	--	2.0	--	1.0	--
14. Publications	--	--	1.0	--	--	--	2.0
15. Auxiliary	--	--	1.0	4.0	--	1.0	8.0
16. Physical Plant	1.0	--	1.0	2.0	--	1.0	4.0
NON-ACADEMIC SUBTOTAL	9.0	--	15.0	8.0	--	11.0	36.0
TOTAL	17.0	--	92.0	99.0	9.0	19.0	65.0

TABLE 2.19

PROGRAM DATA FOR CONFERENCE ROOMS IN AN EXISTING INSTITUTION

DEPARTMENTS	TOTAL FTE IN DEPTS.	SIZE OF LARGEST DEPT.	STATIONS REQUIRED
1. Biological Sciences, Biology, Zoology	19.5 FTE	10.0 FTE	15 Stations
2. Math & Physical Sciences, Mathematics, Chemistry	23.0	12.0	15
3. Geology, Physics	18.5	11.5	15
4. Humanities, English, Classics	21.0	16.5	15
5. Fine Arts, Philosophy	39.5	25.5	25
6. Languages	17.5	17.5	15
7. Social Sciences, Political Science, History	31.5	16.0	20
8. Economics, Sociology	16.0	8.5	10
9. Business, Education	23.5	14.0	15
10. Physical Education	12.0	12.0	10
ACADEMIC SUBTOTAL	222.0 FTE	-	155 Stations 10 Rooms
1. Board of Directors	-----	----	25 Stations
2. Other Non-Academic Depts.	79	14 FTE	15 Stations 10 Stations
NON-ACADEMIC SUBTOTAL	79 FTE	----	50 Stations 3 Rooms
TOTAL	301 FTE	----	205 Stations 13 Rooms

2. Determine the assignable square feet (ASF) criteria:

Offices

- ASF per person who requires office space
  - by discipline sector and/or department and
  - by size of work-station required.
- basic number of ASF of office service area required, plus per-person (or per-record) increments above the base number, by discipline sector and/or department.

TABLE 2.20

OFFICE SPACE ASSIGNABLE SQUARE FEET CRITERIA*

	Assignable Square Feet Per Station						
	FTE ADMINISTRATOR		FTE PROFESSIONAL		FTE GRAD. STU.	FTE SUPPORT	
Departments	Single	Double	Single	Double	Double	Single	Double
Acad.-All	160 $\frac{\text{ASF}}{\text{Station}}$	100 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$
President	300 $\frac{\text{ASF}}{\text{Station}}$	---	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$
Dean of Grad School	200 $\frac{\text{ASF}}{\text{Station}}$	---	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$
All Others	160 $\frac{\text{ASF}}{\text{Station}}$	100 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	80 $\frac{\text{ASF}}{\text{Station}}$	120 $\frac{\text{ASF}}{\text{Station}}$	90 $\frac{\text{ASF}}{\text{Station}}$

*Illustrative only - not suggested as standards.

TABLE 2.21

OFFICE SERVICE SPACE ASSIGNABLE SQUARE FEET CRITERIA*

DEPARTMENTS BY SIZE	SERVICE SPACE AS A PERCENTAGE OF OFFICE SPACE IN A DEPARTMENT
1. Academic Departments	
a. 0 - 4 Work Stations	46%
b. 5 - 19 "	20%
c. 20 - 29 "	19%
d. 30 - 49 "	18%
2. Non-Academic Departments	
a. 0 - 4 Work Stations	76%
b. 5 - 29 "	50%
c. Over 30 "	32%

*Illustrative only - not suggested as standards

Conference Rooms

- ASF per station in conference rooms by discipline sector and/or department

- *Ad hoc* determinations of conference room service area

TABLE 2.22

CONFERENCE ROOM ASSIGNABLE SQUARE FEET CRITERIA*

CONFERENCE ROOM ASSIGNABLE SQUARE FEET STATION		CONFERENCE ROOM SERVICE SPACE AS A PERCENTAGE OF CONFERENCE ROOM AREA
STATIONS	FACTOR	PERCENTAGE
10	25	10%
15	22	10%
20	20	8%
25	20	7%
30	15	5%

*Illustrative only - not suggested as standards

3. Calculate the office, conference room and related space requirements.

Offices

- Calculate the number of offices required by discipline sector and/or department by number of stations and by assignable square feet in each office.
- Calculate the number of ASF of office service area required.

TABLE 2.23
OFFICE REQUIRED BY NUMBER OF STATIONS,
NUMBER OF ASSIGNABLE SQUARE FEET, AND DEPARTMENT
FOR AN EXISTING INSTITUTION

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
1. Biological Sciences	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
2. Biology	Professionals	SINGLE	5.0	5	5	120	600
	"	DOUBLE	2.0	2	1	80	160
	Grad. Ass't.	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	2.0	2	1	90	180
3. Zoology	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	2.5	3	1.5	80	240
	Grad. Ass't.	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	1.0	1	.5	90	90
4. Math & Physical Sciences	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
5. Mathematics	Professionals	SINGLE	5.0	5	5	120	600
	"	DOUBLE	4.5	5	2.5	80	400
	Grad. Ass't.	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	1.5	2	1	90	180
6. Chemistry	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	4.5	5	2.5	80	400
	Grad. Ass't.	DOUBLE	1.5	2	1	80	160
	Support	DOUBLE	2.0	2	1	90	180

TABLE 2.23 (continued)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
7. Geology	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	2.5	3	1.5	80	240
	Grad. Ass't.	DOUBLE	0.5	1	.5	80	80
	Support	DOUBLE	2.0	2	1	90	180
8. Physics	Professionals	SINGLE	3.0	3	3	120	360
	"	DOUBLE	4.0	4	2	80	320
	Grad. Ass't.	DOUBLE	1.5	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	90	180
9. Humanities	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
10. English	Professionals	SINGLE	6.0	6	6	120	720
	"	DOUBLE	8.5	9	4.5	80	720
	Support	DOUBLE	2.0	2	1	90	180
11. Fine Arts	Professional	SINGLE	10.0	10	10	120	1200
	"	DOUBLE	12.0	12	6	80	960
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.5	3	1.5	90	270
12. Philosophy	Professional	SINGLE	7.0	7	7	120	840
	"	DOUBLE	5.0	5	2.5	80	200
	Support	DOUBLE	2.0	2	1	90	180
13. Classics	Professional	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	80	80
	Support	DOUBLE	.5	1	.5	90	90
14. Languages	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	6.0	6	6	120	720
	"	DOUBLE	6.0	6	3	80	480
	Grad. Ass't.	DOUBLE	2.0	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	.5	2	1	90	180
15. Social Sciences	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	.5	1	.5	90	90
16. Political Science	Professional	SINGLE	5.0	5	5	120	600
	"	DOUBLE	6.5	7	3.5	80	560
	Support	DOUBLE	1.5	2	1	90	180

TABLE 2.23 (continued)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
17. History	Professionals	SINGLE	6.0	6	6	120	720
	"	DOUBLE	7.5	8	4	80	640
	Grad. Ass't.	DOUBLE	0.5	1	.5	80	80
	Support	DOUBLE	2.0	2	1	90	180
18. Economics	Professionals	SINGLE	4.0	4	4	120	480
	"	DOUBLE	4.0	4	2	80	320
	Support	DOUBLE	0.5	1	.5	90	90
19. Sociology	Professionals	SINGLE	2.0	2	2	120	240
	"	DOUBLE	4.5	5	2.5	80	400
	Support	SINGLE	1.0	1	1	120	120
20. Business	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	5.0	5	5	120	600
	"	DOUBLE	6.0	6	3	80	480
	Support	DOUBLE	2.0	2	1	90	180
21. Education	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	3.0	3	3	120	360
	"	DOUBLE	4.0	4	2	80	320
	Support	DOUBLE	1.5	2	1	90	180
22. Physical Education	Administrators	SINGLE	1.0	1	1	160	160
	Professionals	SINGLE	3.0	3	3	120	360
	"	DOUBLE	6.0	6	3	80	480
	Support	DOUBLE	2.0	2	1	90	180
ACADEMIC SUBTOTALS	—	—	222.0	232	162.5		22,730
1. President	Administrator	SINGLE	1.0	1	1	300	300
	Professional	SINGLE	1.0	1	1	120	120
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	90	90
2. Academic V.P.	Administrators	SINGLE	1.0	1	1	160	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	90	90
3. Administrative V.P.	Administrator	SINGLE	1.0	1	1	160	160
	Professional	SINGLE	1.0	1	1	120	120
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	90	180

TABLE 2.23 (continued)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	ASF (4) x (6) = 7
4. Business V.P.	Administrator	SINGLE	1.0	1	1	160	160
	Professional	SINGLE	1.0	1	1	120	120
	Support	DOUBLE	2.0	2	1	90	180
5. Student Affairs V.P.	Administrator	SINGLE	1.0	1	1	160	160
	Support	DOUBLE	2.0	2	1	90	180
6. Dean - Graduate School	Administrator	SINGLE	1.0	1	1	200	200
	Support	DOUBLE	2.0	2	1	90	180
7. Dean of Students	Administrator	SINGLE	2.0	2	2	160	320
	Support	SINGLE	1.0	1	1	120	120
8. Admissions	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	90	180
9. Registrar	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	3.0	3	1.5	90	270
10. Budget	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	1.0	1	.5	90	90
11. Business	Professional	SINGLE	2.0	2	2	120	240
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.5	3	1.5	90	270
12. Purchasing	Professional	SINGLE	1.0	1	1	120	120
	Support	DOUBLE	3.5	4	2	90	360
13. Public Information	Professional	DOUBLE	2.0	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
14. Publications	Professional	SINGLE	1.0	1	1	120	120
	Support	DOUBLE	2.0	2	1	90	180
15. Auxiliary	Professional	SINGLE	1.0	1	1	120	120
	"	DOUBLE	4.0	4	2	80	320
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	8.0	8	4	90	720

TABLE 2.23 (Conclusion)

DEPARTMENTS	PERSONNEL CATEGORY (1)	TYPE OF OCCUPANCY (2)	NUMBER OF FTE (3)	NUMBER OF STATIONS (4)	NUMBER OF OFFICES (5)	ASF-PER STATION (6)	TOTAL ASF (4) x (6) = (7)
16. Physical Plant	Administrator	SINGLE	1.0	1	1	160	160
	Professional	SINGLE	1.0	1	1	120	120
	"	DOUBLE	2.0	2	1	80	160
	Support	SINGLE	1.0	1	1	120	120
	"	DOUBLE	4.0	4	2	90	360
NON-ACADEMIC SUBTOTALS	—	---	79.0	80	57.5	---	8,710
TOTALS	—	---	301.0	312	220.0	---	31,440

TABLE 2.24

OFFICE SERVICE SPACE REQUIRED BY DEPARTMENT FOR A NEW INSTITUTION

DEPARTMENTS	ASSIGNABLE SQUARE FEET OF OFFICE SPACE (1)	WORK STATIONS (2)	SERVICE SPACE FACTOR -- (3)	SERVICE SPACE (1) x (3) = 4
1. Biological Sciences	280	2	46%	129
2. Biology	1,020	10	20%	204
3. Zoology	650	7	20%	130
4. Mathematics & Physical Sciences	280	2	46%	129
5. Mathematics	1,260	13	20%	252
6. Chemistry	980	11	20%	196
7. Geology	740	8	20%	158
8. Physics	1,140	12	20%	228
9. Humanities	280	2	46%	129
10. English	1,620	17	20%	324
11. Fine Arts	2,550	26	19%	484
12. Philosophy	1,220	14	20%	244
13. Classics	290	3	46%	133
14. Languages	1,820	18	20%	364
15. Social Sciences	370	3	46%	170
16. Political Science	1,340	14	20%	268
17. History	1,620	17	20%	324
18. Economics	890	9	20%	178
19. Sociology	760	8	20%	152
20. Business	1,420	14	20%	284
21. Education	1,020	10	20%	204
22. Physical Education	1,180	12	20%	236
ACADEMIC SUBTOTALS	22,730 ASF	232 Stations	--	4,920 ASF
1. President	630	4	76%	479
2. Academic Vice President	370	3	76%	281
3. Administrative V.P.	580	5	50%	290
4. Business V.P.	460	4	76%	350
5. Student Affairs	340	3	76%	258
6. Dean - Graduate School	380	3	76%	289
7. Dean of Students	440	3	76%	334
8. Admissions	540	5	50%	270

TABLE 2.24 (Conclusion)

DEPARTMENTS	ASSIGNABLE SQUARE FEET OF OFFICE SPACE (1)	WORK STATIONS (2)	SERVICE SPACE FACTOR (3)	SERVICE SPACE (1) x (3) = 4
9. Registrar	630	6	50%	315
10. Budget	450	4	76%	342
11. Business	530	6	50%	315
12. Purchasing	480	5	50%	240
13. Public Information	280	3	76%	213
14. Publications	300	3	76%	228
15. Auxiliary	1,280	14	50%	640
16. Physical Plant	920	9	50%	460
NON-ACADEMIC SUBTOTALS	8,710 ASF	80 Stations	---	5,304 ASF
TOTALS	31,440 ASF	312 Stations	---	10, 224 ASF

Conference Rooms

- Determine the number of conference rooms required by discipline sector and/or department by number of stations and by assignable square feet in each conference room.

- Determine the number of ASF of conference room service space is required.

TABLE 2.25
CONFERENCE ROOMS AND CONFERENCE
ROOM SERVICE BY DEPARTMENTS FOR A NEW INSTITUTION

Departments	Total FTE	Stations Required	ASF/Station Factor	Conference Room ASF	Conference Service Factor	Conference Service ASF
1. Biological Sciences, Biology, Zoology	19.5	15	22	330	10%	33
2. Math. & Physical Sciences, Mathematics, Chemistry	23.0	15	22	330	10%	33
3. Geology, Physics	18.5	15	22	330	10%	33
4. Humanities, English, Classics	21.0	15	22	330	10%	33
5. Fine Arts, Philosophy	39.5	25	20	400	8%	32
6. Languages	17.5	15	22	330	10%	33
7. Social Sciences, Political Science, History	31.5	20	20	400	8%	32
8. Economics, Sociology	16.0	10	25	250	10%	25
9. Business, Education	23.5	15	22	330	10%	33
10. Physical Education	120	10	25	250	10%	25
Academic Subtotal	222.0 FTE	155 Stations 10 Rooms	--	3330 ASF	---	312 ASF

TABLE 2.25 (Conclusion)

Departments	Total FTE	Stations Required	ASF/Station Factor	Conference Room ASF	Conference Service Factor	Conference Service ASF
1. Board of Directors		25	20	400	8%	32
2. Other Non-Academic Departments	79	15 10	22 25	330 250	10% 10%	33 25
Non-Academic Subtotal	79 FTE	55 Stations 3 Rooms	--	980 ASF	--	90 ASF
Total	301 FTE	210 Stations 13 Rooms	--	4310 ASF	--	402 ASF

4. Compare the inventory of existing facilities by discipline sector and/or department, with the projected office and conference room requirements.

TABLE 2.26
COMPARISON OF EXISTING AND PROJECTED OFFICE AND CONFERENCE ROOM FACILITIES FOR AN EXISTING INSTITUTION

	EXISTING FACILITIES				PROJECTED FACILITIES			
DEPARTMENTS	NUMBER OF OFFICES	STATIONS IN EACH OFFICE	ASF IN EACH OFFICE	ASF IN OFFICE SERVICE	NUMBER OF OFFICES	STATIONS IN EACH OFFICE	ASF IN EACH OFFICE	ASF IN OFFICE SERVICE
1. BIOLOGICAL SCIENCES	1	1	128	22	1	1	160	129
	½	1	70		1	1	120	
2. BIOLOGY	4	1	110		5	1	120	
	1	1	119	94	1	2	160	204
	½	1	79		½	2	160	
	½	1	67		1	2	180	
3. ZOOLOGY	2	1	110		2	1	120	
	2	1	121	66	1½	2	160	130
	½	1	80		½	2	160	
	½	1	62		½	2	180	
4. MATH. & PHYS. SCI.	1	1	191	25	1	1	160	129
	½	1	69		1	1	120	
5. MATHEMATICS	4	1	100		5	1	120	
	1	2	160		2½	2	160	252
	1	1	98		½	2	160	
	½	1	70		1	2	180	
	1	1	80		--	--	--	
6. CHEMISTRY	2	2	223		2	1	120	
	1	2	204	56	2½	2	160	196
	1	1	120		1	2	160	
	1	1	126		1	2	180	
7. GEOLOGY	2	1	95	40	2	1	120	
	1	1	143		1½	2	160	158
	--	--	--		1½	2	160	
	--	--	--		1	2	180	
8. PHYSICS	2	2	192		3	1	120	
	2	1	118	72	2	2	160	228
	½	1	68		1	2	160	
	½	1	65		1	1	120	
	--	--	--		1	2	160	
9. HUMANITIES	½	1	74	40	1	1	160	129
	1	1	154		1	1	120	
10. ENGLISH	4	1	121		6	1	120	
	3	2	157	102	4½	2	160	324
	1	1	100		1	2	180	
	1	2	128		--	--	--	

TABLE 2.26 (continued)

11. FINE ARTS	3	1	208	98	10	1	120	484
	8	1	122		6	2	160	
	2	1	147		1	1	120	
	1	2	217		1½	2	180	
12. PHILOSOPHY	6	1	111	86	7	1	120	244
	1	2	181		2½	2	160	
	1	1	100		1	2	180	
	½	1	78		--	--	--	
13. CLASSICS	1	1	155	10	1	1	120	133
	--	--	--		½	2	160	
	--	--	--		½	2	180	
14. LANGUAGES	3	1	112	96	1	1	160	364
	7	1	144		6	1	120	
	½	1	65		3	2	160	
	1	2	311		1	2	160	
	--	--	--		1	1	120	
	--	--	--		1	2	180	
15. SOCIAL SCIENCES	1	1	124	47	1	1	160	170
	½	1	78		1	1	120	
	--	--	--		½	2	180	
16. POLITICAL SCIENCE	6	1	102	100	5	1	120	268
	1	2	180		3½	2	160	
	1	1	95		1	2	180	
	1	1	131		--	--	--	
17. HISTORY	3	2	200	106	6	1	120	324
	4	1	104		4½	2	160	
	1	1	90		1	2	180	
	1	1	139		--	--	--	
18. ECONOMICS	4	1	103	62	4	1	120	178
	1	1	110		2	2	160	
	1	1	119		½	2	180	
19. SOCIOLOGY	5	1	103	54	3	1	120	152
	½	1	79		2½	2	160	
20. BUSINESS	1	1	103	108	1	1	160	284
	4	1	95		5	1	120	
	5	1	93		3	2	160	
	1	2	196		1	2	180	
21. EDUCATION	1	1	106	76	1	1	160	204
	1	1	107		3	1	120	
	4	1	102		2	2	160	
	1	2	130		1	2	180	
22. PHYS. EDUCATION	1	1	128	84	1	1	160	236
	4	1	145		3	1	120	
	1	2	180		3	2	160	
	1	1	104		1	2	180	
ACADEMIC SUBTOTALS	142	162	17560	1514	162½	232	22730	4920
1. PRESIDENT	1	1	265	45	1	1	300	479
	1	1	110		2	1	120	
	1	1	120		½	2	180	

TABLE 2.26 (Conclusion)

2. ACADEMIC V.P.	1 1 --	1 1 --	120 90 --	16	1 1 ½	1 1 2	160 120 180	281
3. ADMINISTRATIVE V.P.	1 2 1	1 1 2	158 110 176	32	1 2 1	1 1 2	160 120 180	290
4. BUSINESS V.P.	1 2 --	1 1 --	154 120 --	36	1 1 1	1 1 2	160 120 180	350
5. STUD. AFFAIRS V.P.	1 1	1 2	143 182	18	1 1	1 2	160 180	258
6. DEAN - GRAD SCHOOL	1 1	1 2	126 182	18	1 1	1 2	200 180	289
7. DEAN OF STUDENTS	1 1	1 1	135 86	10	2 1	1 1	160 120	334
8. ADMISSIONS	1 1	1 2	100 92	110	3 1	1 2	120 180	270
9. REGISTRAR	2 1	1 3	106 187	88	3 1½	1 2	120 180	315
10. BUDGET	1 1	1 1	37 122	46	3 ½	1 2	120 180	342
11. BUSINESS	1 1	2 2	178 181	46	3 1½	1 2	120 180	315
12. PURCHASING	1 1	1 2	92 194	46	1 2	1 2	120 180	240
13. PUBLIC INFORMATION	1 1	1 1	138 103	22	1 1	1 2	120 160	213
14. PUBLICATIONS	1 1	1 1	121 104	82	1 1	1 2	120 180	228
15. AUXILIARY	4 7 -- --	1 1 -- --	131 102 -- --	56	1 2 1 4	1 2 1 2	120 160 120 180	640
16. PHYSICAL PLANT	3 1	1 4	110 320	66	1 2 1 2	1 1 2 2	160 120 160 180	460
NON-ACADEMIC SUBTOTALS	48	60	6356	737	57½	80	8710	5304
TOTALS	190	222	23916	2251	220	312	31440	10224

TABLE 2.27

COMPARISON OF EXISTING AND PROJECTED CONFERENCE ROOM AND CONFERENCE ROOM SERVICE FACILITIES FOR AN EXISTING INSTITUTION

DEPARTMENTS	EXISTING FACILITIES			PROJECTED FACILITIES		
	STATIONS	CONFERENCE ROOM ASF	CONFERENCE ROOM SERVICE ASF	STATIONS	CONFERENCE ROOM ASF	CONFERENCE ROOM SERVICE ASF
1. Biological Sciences, Biology, Zoology	15	225	0	15	330	33
2. Math. & Phys. Sci., Mathematics, Chemistry				15	330	33
3. Geology, Physics				15	330	33
4. Humanities, English, Classics	15	353	22	15	330	33
5. Fine Arts, Philosophy				25	400	32
6. Languages				15	330	33
7. Social Sciences, Political Science, History	20	270	30	20	400	32
8. Economics, Sociology				10	250	25
9. Business, Education	15	360	15	15	330	33
10. Physical Education	15	340	35	10	250	25
Academic Subtotal	80	1548	102	155	3330	312
1. Board of Directors	25	600	25	25	400	32
2. Other Non-Academic Dept	10	100	20	15 10	330 250	33 25
Non-Academic Subtotal	35	700	45	50	980	90
Total	115	2248	147	205	4310	402

5. Determine:

Offices

- The number of additional offices by disicipline sector and/or department
- The number of stations in each additional office
- The assignable square feet in each additional office
- The assignable square feet in additional office service areas by discipline sector and/or department

TABLE 2.28

ADDITION OFFICE AND OFFICE SERVICE FACILITIES REQUIREMENTS FOR AN EXISTING INSTITUTION

DEPARTMENT	ADDITIONAL OFFICES REQUIRED	STATIONS PER OFFICE	ASSIGNABLE SQUARE FEET PER OFFICE	ADDITIONAL ASSIGNABLE SQUARE FEET OF OFFICE SERVICE
1. BIOLOGICAL SCIENCES	1	1	160	107
2. BIOLOGY	1 ½	2 2	180 160	110
3. ZOOLOGY	½ ½	2 2	160 180	64
4. MATH. & PHYSICAL SCIENCES	1	1	120	104
5. MATHEMATICS	1 1	2 2	160 180	182
6. CHEMISTRY	1	2	160	140
7. GEOLOGY	2 1	2 2	160 180	118
8. PHYSICS	1 1	1 2	120 160	156
9. HUMANITIES	1	1	120	89
10. ENGLISH	1 1	2 2	160 180	222
11. FINE ARTS	2 1 1½	2 1 2	160 120 180	386
12. PHYILOSOPHY	2½	2	160	158
13. CLASSICS	½	2	180	123
14. LANGUAGES	1 1	1 2	160 160	268
15. SOCIAL SCIENCES	0	0	0	123
16. POLITICAL SCIENCE	3½	2	160	168

TABLE 2.28 (Conclusion)

DEPARTMENT	ADDITIONAL OFFICES REQUIRED	STATIONS PER OFFICE	ASSIGNABLE SQUARE FEET PER OFFICE	ADDITIONAL ASSIGNABLE SQUARE FEET OF OFFICE SERVICE
17. HISTORY	2	2	160	218
18. ECONOMICS	0	0	0	116
19. SOCIOLOGY	½	2	160	98
20. BUSINESS	1½	2	160	176
21. EDUCATION	½	2	180	128
	1	2	160	
22. PHYSICAL EDUCATION	1	2	160	152
ACADEMIC SUBTOTALS	35	64	5580	3406
1. PRESIDENT	0	0	0	434
2. ACADEMIC VICE PRESIDENT	1	1	160	265
3. ADMINISTRATIVE VICE PRESIDENT	0	0	0	248
4. BUSINESS VICE PRESIDENT	1	2	180	314
5. STUDENT AFFAIRS VICE PRESIDENT	0	0	0	240
6. DEAN OF THE GRADUATE SCHOOL	0	0	0	271
7. DEAN OF STUDENTS	2	1	160	224
8. ADMISSIONS	2	1	120	160
9. REGISTRAR	2	1	120	227
10. BUDGET	2	1	120	296
	½	2	180	
11. BUSINESS	1	1	120	269
	½	2	180	
12. PURCHASING	1	2	180	194
13. PUBLIC INFORMATION	½	2	160	182
14. PUBLICATIONS	0	0	0	146
15. AUXILIARY	0	0	0	584
16. PHYSICAL PLANT	1½	2	160	263
NON-ACADEMIC SUBTOTALS	15	20	2180	4317
TOTALS	50	84	7760	7723

Conference Rooms

The number of additional conference rooms by discipline sector and/or department

The number of stations in each additional conference room

The assignable square feet in each additional conference room

The assignable square feet in additional conference room service areas by discipline sector and/or department

TABLE 2.29

ADDITIONAL CONFERENCE ROOM AND CONFERENCE ROOM SERVICE FACILITIES REQUIREMENTS FOR AN EXISTING INSTITUTION

DEPARTMENT	NUMBER OF CONFERENCE ROOMS	STATIONS IN EACH CONF. ROOM	CONFERENCE ROOM ASF	CONF. ROOM SERVICE ASF
1. Biological Sciences, Biology, Zoology	0	0	0	33
2. Math. & Phys. Sci., Mathematics, Chemistry	1	15	330	33
3. Geology, Physics	1	15	330	33
4. Humanities, English Classics	1	15	330	33
5. Fine Arts, Philosophy	0	0	0	10
6. Languages	1	15	330	33
7. Social Sciences, Political Science, History	1	20	400	32
8. Economics, Sociology	0	0	0	0
9. Business, Education	0	0	0	18
10. Physical Education	0	0	0	0
Academic Subtotal	5 Rooms	80 Stations	1720 ASF	225 ASF
1. Board of Directors	0	0	0	7
2. Other Non-Academic Departments	1 1	15 10	330 250	33 25
Non-Academic Subtotal	2 Rooms	25 Stations	580 ASF	58 ASF
TOTAL	7 Rooms	105 Stations	2300 ASF	383 ASF

DISCUSSION

GENERAL PLANNING METHOD A

PROJECTION OF TOTAL OFFICE-OFFICE RELATED FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Additional number of office stations required
- additional assignable square feet of office-office related facilities required.

PROGRAM DATA REQUIRED:

- Projected total number of FTE faculty,
- projected total number of FTE graduate assistants,
- projected total number of FTE secretarial and clerical employees in academic departments,
- projected total number of FTE non-faculty professionals (administrators, executives, librarians, etc), and
- projected total number of FTE secretarial and clerical employees in non-academic departments.

FACILITIES DATA REQUIRED:

- Existing number of stations and assignable square feet of office-office related facilities assigned to academic departments and
- existing number of stations and assignable square feet of office-office related facilities assigned to non-academic departments.

UTILIZATION ASSUMPTIONS REQUIRED:

- Average number of assignable square feet of office-office related space required per FTE faculty member,
- average number of assignable square feet of office-office related space required per FTE graduate assistant,
- average number of assignable square feet of office-office related space required per FTE secretarial and clerical employee in academic departments,

- average number of assignable square feet of office-office related space required per FTE non-academic professional, and
- average number of assignable square feet of office-office related space required per non-academic secretarial and clerical employees.

It should be specifically noted that use of the term "office-office related" implies that the factors used include an allowance for office service, conference and conference service space in addition to an allowance for office space. Use of an office factor which does not include an allowance for these other types of space will result in underestimation of the facilities required.

PROCEDURE:

1. Obtain, as outputs of the program planning and analysis procedures, projections of numbers of personnel requiring office space:
    - FTE faculty,
    - FTE graduate assistants,
    - FTE secretarial and clerical employees in academic departments,
    - FTE non-academic professionals, and
    - FTE secretarial and clerical employees in non-academic departments.
2. Establish planning factors in terms of assignable square feet of office-office related space for each category of personnel requiring office space.
3. Calculate the net assignable square feet of office-office related facilities required to house the projected number of employees in each category. This calculation consists of multiplying the number of FTE employees in each category by the appropriate average number of assignable square feet of office-office related space required per FTE employee.

    The total number of assignable square feet of office-office related facilities required for academic and non-academic departments can be obtained by summation if the requirements for faculty, graduate assistants and academic department clerical personnel combine to yield the total amount of academic department office space.

4. Determine the additional amount of office-office related space required.

   This is accomplished by subtracting the existing amount of office-office related space available to academic and non-academic departments from the projected amounts.

AN EXTENSION OF THE PROCEDURE:

Much of the usefulness of this procedure is negated if the data, which allows determination of number of additional stations required, are not fully utilized. By calculating additional stations required and converting this into requirements for additional square feet of office, it is possible to obtain a check on the results of the procedure described above. The steps of this procedure are:

1) Obtain projections of numbers of personnel requiring office space and equate these numbers to stations.

   - FTE faculty,

   - FTE graduate assistants,

   - FTE secretarial and clerical employees in academic departments,

   - FTE non-academic professionals, and

   - FTE secretarial and clerical employees in non-academic departments.

   By making the simplifying assumption that office stations are assigned on the basis of full-time equivalency, the number of FTE employees in each category can be equated with the projected number of stations required for that category of employee.

2) Determine the (approximate) number of employees in each category who can be accommodated within currently available facilities.

   This determination is based on the procedures described in Section 2.11 of this chapter entitled "Evaluation of Existing Office-Office Related Room Capacity" (page 4). As part of this procedure, the number of individuals currently assigned to each room and the capacity of each room to accommodate additional employees of a similar category were determined for each on a department-by-department basis.

By aggregating the total number of employees who can be accommodated according to employee category and type of department (i.e., academic or non-academic), the total number of stations currently available to house employees of each category can be determined.

3) Determine the additional stations required for each category of employees.

This is accomplished by subtracting available number of stations for each group of employees from the projected number of employees in each of the categories.

4) Convert station requirements to assignable square feet.

This conversion consists of multiplying the number of additional stations required for each category of employee by the average number of assignable square feet of office-office related facilities required per FTE employee of each category.

5) Compare results obtained with those obtained through application of the procedures previously described in this section and determine the reasons for any significant differences.

COMMENTS ON THE PROCEDURE:

The advantage of this method over general planning Method B (described in the next section) stems from the fact that it bases the measure of current capacity on stations rather than on assignable square feet. As a result, it is possible to reflect more accurately existing current conditions than is possible through use of Method B.

As with all general planning methods, the technique is based on several simplifying assumptions and, therefore, has numerous limitations.

First, while number of stations should be a more accurate indicator of current capacity than area, there is considerable difficulty associated with arriving at this number.

It is impossible to specify an exact or optimum number of stations in a particular room since this number varies as a function of the user of the room. The same room might accommodate one department chairman or two clerical employees or three graduate assistants. The result is that current capacity of office facilities must be based on "status quo" assumptions. Specifically, the generalized assumption must be that all rooms will continue to be occupied by employees of the same type as the current occupants. To obviate the restrictions imposed by this assumption, a review of assignments on a room-by-room basis is required, revising them where necessary. The amount of effort and the level of detail associated with this process are generally inconsistent with the objectives of a general planning methodology. Therefore, for quick estimation purposes, it is suggested that the simplifying assumptions about use of current space be accepted, but also that the limitations be recognized.

Second, the very important consideration of physical location of office space is largely ignored. Departmental considerations are neglected except for the distinction between academic and non-academic departments. The inefficiencies of space assignment, which develop because it is difficult to house a clerk from the registrar's office at the empty desk in the treasurer's office or to assign the chemistry faculty member in the midst of the archeologists, are not recognized in this method. Departmental affiliations are extremely important in projecting needs for office space, but cannot be taken into account except through use of the very detailed methodology described previously in Sections 2.11 - 2.13 (pages 4 through 76).

EXAMPLE

GENERAL PLANNING METHOD A

PROJECTION OF TOTAL OFFICE-OFFICE RELATED FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Additional number of office stations required
- Additional assignable square feet of office-office related facilities required.

PROCEDURE:

1. Obtain, as outputs of the program planning and analysis procedures, projections of numbers of personnel requiring office space:

TABLE 2.30

NUMBER OF PERSONNEL REQUIRING OFFICE SPACE

1. FTE Academic Administrators	8
2. FTE Faculty	168
3. FTE Graduate Assistants	9
4. FTE Secretarial and Clerical Employees in Academic Departments	37
5. FTE Academic Subtotal	222
6. FTE Non-academic Administrators	9
7. FTE Non-academic Professionals	23
8. FTE Secretarial and Clerical in Non-academic Departments	47
9. Non-Academic Subtotal	79
TOTAL	301

2. Establish planning factors in terms of assignable square feet of office-related space for each category of personnel requiring office space.

TABLE 2.31
PLANNING FACTORS FOR
OFFICE-OFFICE RELATED SPACE

Category	Planning Factor
1. Academic administrators	160 ASF/FTE
2. Faculty	120 ASF/FTE
3. Graduate assistants	80 ASF/FTE
4. Academic secretarial and clerical	90 ASF/FTE
5. Non-academic administrators	160 ASF/FTE
6. Non-academic professionals	120 ASF/FTE
7. Non-academic secretarial and clerical	90 ASF/FTE

3. Calculate the net assignable square feet of office-office related facilities to house the projected number of employees in each factor.

TABLE 2.32
NET ASSIGNABLE SQUARE FEET OF
OFFICE-OFFICE RELATED FACILITIES

Personnel Category Number of Personnel FTE (1)	Planning Factor ASF/FTE (2)	Space Needs ASF (1) x (2) - (3)
1. 8 FTE academic administrators	160 ASF/FTE	1,280
2. 168 FTE faculty	120 ASF/FTE	20,160
3. 9 Graduate assistants	80 ASF/FTE	720
4. 37 FTE Academic support	90 ASF/FTE	3,330
5. Academic Subtotal	----------	25,490
6. 9 Non-academic administrators	160 ASF/FTE	1,440
7. 23 FTE Non-academic professionals	120 ASF/FTE	2,760
8. 47 FTE Non-academic support	90 ASF/FTE	4,230
9. Non-Academic Subtotal	-----------	8,430
TOTAL	-----------	33,920

4. Determine the additional amount of office-office related space required;

TABLE 2.33

ADDITIONAL OFFICE-OFFICE RELATED SPACE REQUIRED

Currently Available Office-Related Space ASF (1)	Projected Office-Related Space Requirements ASF (2)	Additional Office-Related Space Required ASF (2) - (1) = (3)
26,100	33,920 ASF	7,820 Additional ASF

EXTENSION OF PROCEDURE:

1. Obtain projections of numbers of personnel requiring office space and equate these numbers to stations.

TABLE 2.34

NUMBER OF PERSONNEL REQUIRING OFFICE SPACE

Personnel	Number	Stations
1. FTE Academic administrators	8	8
2. FTE Faculty	168	168
3. FTE Graduate assistants	9	9
4. FTE Academic support	37	37
5. Academic Subtotal	222	222
6. FTE Non-academic administrators	9	9
7. FTE Non-academic professionals	23	23
8. FTE Non-academic support	47	47
9. Non-Academic Subtotal	79	79
TOTALS	301	301

2. Determine the (approximate) number of employees in each category who can be accommodated in currently available office facilities.

TABLE 2.35

CAPACITY OF CURRENTLY AVAILABLE OFFICE FACILITIES

	Employee Category	Current Stations	Additional Available
1.	7 FTE Academic administrators	8	1
2.	124 FTE Faculty	127	3
3.	6 FTE Graduate assistants	6	0
4.	19 FTE Academic support	21	2
5.	Academic Subtotal	162	+6
6.	7 FTE Non-academic administrators	8	0
7.	18 FTE Non-academic professionals	17	-1
8.	38 FTE Non-academic support	35	-3
	Non-Academic Subtotal	60	-4
	TOTAL	222	+2

3. Determine additional stations required for each category of employees.

TABLE 2.36

ADDITIONAL OFFICE STATIONS REQUIRED

Projected Number of Employees by Category	Currently Available Stations	Additional Stations Required
1. 8 FTE Academic administrators	8	0
2. 168 FTE Faculty	127	41
3. 9 FTE Graduate assistants	6	3
4. 37 FTE Academic support	21	16
5. Academic Subtotal	162	60
6. 9 FTE Non-academic administrators	8	1
7. 23 FTE Non-academic professionals	17	6
8. 47 FTE Non-academic support	35	12
9. Non-Academic Subtotal	60	19
Total	222	79

4. Convert station requirements into terms of assignable square feet.

TABLE 2.37

ASSIGNABLE SQUARE FEET OF OFFICE-OFFICE RELATED REQUIREMENTS

Additional Stations Required for Type of Personnel	Planning Factor ASF/FTE	Additional Assignment Square Feet Required ASF
1. 41 Faculty Stations	120	4,920
2. 3 Graduate Assistant Stations	80	240
3. 16 Academic Support Stations	90	1,440
Academic Subtotal	---	6,600 ASF
4. 2 Non-Academic Administration Stations	160	320
5. 5 Non-Academic Professional Stations	120	600
6. 12 Non-Academic Support Stations	90	1,080
Non-Academic Subtotal	---	2,000 ASF
TOTAL		8,600 ASF

5. Compare the results

TABLE 2.38

DIFFERENCE BETWEEN "PROCEDURE" and "EXTENDED PROCEDURE"

	Procedure	Extended Procedure
Additional Office-Related Space Required	7,820 ASF	8,600 ASF

DISCUSSION

GENERAL PLANNING METHOD B

PROJECTION OF TOTAL ASSIGNABLE SQUARE FEET OF OFFICE-OFFICE RELATED REQUIREMENTS

DATA TO BE DETERMINED:

- Additional assignable square feet of office-office related space

PROGRAM DATA REQUIRED:

- Projected number of full-time equivalent students

  Since the total office requirements for an institution do change as the mix of students at the institution changes, accuracy of office space calculations can be improved by projecting the number of full-time equivalent students according to levels of students. For most institutions the following categories of student level will be sufficient:

  - lower division undergraduate
  - upper division undergraduate
  - graduate

FACILITIES DATA REQUIRED:

- Existing assignable square feet of office-office related space

  A variation of this method requires that this value be subdivided into two components

  1) Existing assignable square feet of office-office related space assigned to "academic" units (codes 1000-5000 in the Higher Education Facilities Classification Manual).

  2) Existing assignable square feet of office-office related space assigned to general and administrative purposes (codes 6000 and 7000).

SPACE FACTORS REQUIRED:

- The assignable square feet of office-office-related-space-per-FTE-student-factor to be used as a basis for projecting office facilities needs.

  In those instances in which FTE students are projected according to student levels, the space factors should be differentiated according to those same levels, although it is possible for an institution to choose the same factor for more than one level of student.

  Illustrative factors are listed in Manual Six, Section 5.0.

NOTE CONCERNING THE SPACE FACTOR

The general planning method deals with all office-office related facilities (i.e., office, office service, conference room, and conference room service facilities) as a single category. As a result, when a value (or series of values) for the space factor is being selected, extreme care must be exercised to insure that allowances for conference room and service spaces are included. This problem is compounded by varying definitions of FTE. There is a very real danger associated with borrowing factors without knowing exactly what is included nor what definition of FTE was used in their development.

PROCEDURE:

1. Obtain the projected number of FTE students (categorized by level, if possible).

2. Establish, as an institutional planning factor or as an externally developed factor, the average number of assignable square feet of office-office related facilities required per FTE student.

   Sensitivity of the calculation will be improved if separate factors are established for each of the student level categories.

3. Determine the total assignable square feet of office-office related space required.

   This is obtained by mutliplying the projected number of FTE students by the estimated average number of FTE students by the estimated average number of assignable square feet of office-office related space required per FTE student. When projections of FTE students are made by level of student, this determination requires multiplying the projected number of FTE students of each level, by the average number of assignable square feet allowed per FTE student at each level and summing the products.

4. Determine the number of assignable square feet of office-office related space which must be added in the interval between the present year and the year for which the projection is being made.

   This is obtained by subtracting the existing number of assignable square feet from the projected need.

COMMENTS ON THE PROCEDURE:

As with any procedure which is based on averages and which incorporates a minimum number of variables, there exists the possibility of significant error. This General Planning Method for calculating requirements for office-office related facilities is no different. The possible sources of error in this particular procedure are invalid student projections and unrealistic estimates of office-office related facilities required per FTE student.

In addition, this procedure includes an implied assumption that a given amount of existing office space has the same capacity as an equivalent amount of new office space. However, the construction characteristics of existing space may be such that this is not the case. For example, current offices may be over-sized when compared with current planning factors. Application of the general planning procedures would therefore underestimate the requirements for additional space since more capacity than actually exists will be attributed to present space.

Because the possibility of significant error does exist, the results obtained from the use of such procedures should not be accepted without some form of critical evaluation by the institutional planner.

EXAMPLE

GENERAL PLANNING METHOD B

PROJECTION OF TOTAL ASSIGNABLE SQUARE FEET OFFICE-OFFICE RELATED REQUIREMENTS

DATA TO BE DETERMINED:

Additional assignable square feet of office-office related space.

PROCEDURE:

1. Obtain the projected number of FTE students (categorized by level).

TABLE 2.39

PROJECTED NUMBER OF FTE STUDENTS

Student Level	Number of FTE Students
1. Lower Division Undergraduate	1527 FTE
2. Upper Division Undergraduate	873 FTE
TOTAL	2400 FTE

2. Establish as an institutional planning factor or as an externally developed factor, the average number of assignable square feet of office-office related facilities required per full time equivalent student

TABLE 2.40
PLANNING FACTOR (ASF/FTE) STUDENT
OFFICE-OFFICE RELATED FACILITIES REQUIREMENTS

Student Level	Planning Factor (ASF/FTE Student)
1. Lower Division Undergraduate	13.5 ASF/FTE Student
2. Upper Division Undergraduate	15.5 ASF/FTE Student

3. Determine the total assignable square feet of office-office related space required.

TABLE 2.41

TOTAL ASSIGNABLE SQUARE FEET OF OFFICE-OFFICE RELATED SPACE REQUIRED

Student Level (1)	Projected Students FTE (2)	Planning Factor ASF/FTE (3)	Office Space Requiring ASF (2) x (3) = (4)
Lower Division Undergraduate	1527	13.5	20,614
Upper Division Undergraduate	873	15.5	13,532
TOTAL	2400	NA	34,146 ASF

4. Determine the number of assignable square feet of office-office related space which must be added in the interval between the present year and the year for which the projection is being made.

TABLE 2.42

ADDITIONAL ASSIGNABLE SQUARE FEET OF OFFICE-OFFICE RELATED SPACE REQUIRED

Currently Available Office Related Space (ASF) (1)	Projected Office-Related Space Requirements (ASF) (2)	Addition Office-Related Space Requirements (ASF) (2) - (1) = (3)
26,100 ASF	34,146 ASF	8,046 ASF

UNIT FLOOR AREA CRITERIA

ROOM TYPE: Office Facilities

ROOM TYPE CODES:
310 Office
315 Office Service
350 Conference Room
355 Conference Room Service

Office Unit Floor Area Criteria tabulated by:

- Personnel Category
- Degree of Privacy
- Type of Organizational Unit

DISCUSSION:

Table 2.42 displays design criteria which have been developed in terms of assignable square feet per office or per station as indicated. The ranges in the values allow for distinctions to be made on the basis of level where this is the practice.

DESIGN CRITERIA:

TABLE 2.42

RANGES OF OFFICE SPACE UNIT FLOOR AREA CRITERIA

OCCUPANCY	ACADEMIC DEPARTMENTS			NON-ACADEMIC DEPARTMENTS		
	SINGLE	DOUBLE	MULTIPLE	SINGLE	DOUBLE	MULTIPLE
PERSONNEL CATEGORY	ASF/OFFICE	ASF/OFFICE	ASF/STATION	ASF/OFFICE	ASF/OFFICE	ASF/STATION
1. Administrator - President	-	-	-	275-350	-	-
Vice Pres.	-	-	-	200-250	-	-
Dean	180-220	-	-	-	-	-
Chairman	140-180	-	-	-	-	-
2. Professional	120-135	160-180	80-90	110-140	160-180	80-90
3. Secretarial-Clerical	110-130	140-180	70-80	110-160	140-180	70-80
4. Graduate Assistants	80-120	80-120	40-60	-	-	-

Office Service Space Unit Floor Area Criteria tabulated by:

- Type of Organizational Unit
- Size of Department

DISCUSSION:

Table 2.43 displays unit floor area criteria for service as percentages of office space, The criteria are given in ranges of size of department determined by the number of work stations to allow for differences in operational style as well as institutional policy.

Table 2.44 is a tabulation of unit floor area criteria for selected but commonly used types of office equipment and furniture.

DESIGN CRITERIA:

TABLE 2.43

RANGES OF OFFICE SERVICE SPACE UNIT FLOOR AREA CRITERIA

SIZE DEPARTMENT NUMBER OF WORK STATIONS	ACADEMIC DEPARTMENTS	NON-ACADEMIC DEPARTMENTS
	PERCENTAGE OF OFFICE SPACE %	PERCENTAGE OF OFFICE SPACE %
0- 9	40% - 48%	85% - 96%
10-19	19% - 22%	80% - 92%
20-29	18% - 21%	75% - 90%
30-49	17% - 20%	50% - 75%
50-74	14% - 17%	40% - 50%
75 & Over	14% - 17%	30% - 40%
AVERAGE	19%	76%

TABLE 2.44

OFFICE EQUIPMENT AND FURNITURE UNIT FLOOR AREA CRITERIA

ITEM	UNIT FLOOR AREA CRITERIA - ASSIGNABLE SQUARE FEET	DIMENSIONS
1. Files: Letter	10 ASF	2'6" x 1'3"
Legal	12	2'6" x 1'6"
2. Bookcase	12	3'0" x 1'0"
3. Supply Cabinet	14	3'0" x 1'6"
4. Coat Rack	19	4'3" x 1'4"
5. Work Table	39	5'0" x 2'6"
6. Side Chair	7	1'6" x 1'6"
7. Typewriter Stand	21	2'10" x 1'6"
8. Safe	50	3'6" x 2'6"
9. Keypunch	28	2'7" x 2'4"

Conference Room Unit Floor Area Criteria tabulated by:

- Number of Stations

DISCUSSION:

Table 2.45 is a tabulation of suggested design criteria for conference rooms. It is assumed that conferences attended by more than 40 persons will be held in classrooms or lecture halls.

DESIGN CRITERIA:

TABLE 2.45

RANGES OF CONFERNCE ROOM UNIT FLOOR AREA CRITERIA

NUMBER OF STATIONS	ASSIGNABLE SQUARE FEET PER STATION
10-15	20-30
16-20	20-30
21-25	20-30
26-30	20-25
31-35	20-25
36-40	18-22
41-45	18-22

RESEARCH AND GRADUATE TRAINING FACILITIES

ROOM TYPES INCLUDED:

Non-class laboratories and related service areas.

GENERAL DISCUSSION:

Non-class laboratories normally house research and graduate training activities. Unfortunately for the planner, their activities are not confined to non-class laboratories (nor are the uses of non-class laboratories confined to research and graduate training activities). As a result, the processes of estimating future demands for space to house these activities are lacking in rigor and certainty. In an effort to put the requirements for non-class laboratories in perspective, the factors which contribute to this uncertainty are discussed in the following paragraphs.

First, there is no well-defined group of research space-users. The users of such facilities are a mixture of faculty members, students, and technicians and other support employees and the numbers within each group may depend more on economic (funding) considerations than on program considerations.

Second these users are accommodated within a variety of facilities in addition to non-class laboratories. Much research activity is carried on in offices and libraries and an increasing amount is being conducted in data-processing facilities. Although the subject matter area (or discipline sector) in which the research is being carried out is an important determinant of research space, designation of the predominant subject matter areas is an insufficient basis for determining requirements for those types of space in which research is conducted. While it is generally true that engineering, agriculture, and the biological and physical sciences require more space for research activities than do most other disciplines, interests within almost every discipline have broadened to the point where there are no longer disciplines which are strictly oriented toward offices and/or libraries. In almost all departments or disciplines there are individuals who are interested in the experimental aspects (and require laboratory space) and there are those involved in the theoretical aspects (and use office and library facilities).

Third, the element of time is not a consideration in the determination of research space needs. The total amount, or the proportion, of an individual's time which is devoted to research activities is probably much less of a consideration in determining the necessary research space than is the mere fact of his involvement. The nature of research activities is such that, if an individual engages in research activities at all, an incremental amount of space (often of significant proportions) must be made available to him. As the percentage of an individual's effort which is devoted to research increases, the amount of space required may also increase; but, in all probability, at a less than proportionate rate. A full-time research staff member will seldom require as much space as four one-quarter-time research faculty members in the same discipline.

Finally, research activities basically are not people-oriented; research facilities are primarily equipment-oriented. Some minimum area which is required to provide an individual with nothing more than benchtop work space can be defined as a matter of architectural consideration and human engineering. This minimum area is probably of the order of 55-70 square feet. Any space required by an individual which is in excess of this minimum amount is a function of the equipment that individual uses in his research work. The space needs generated by such equipment varies drastically--not from discipline to discipline or from department to department, but from project to project and from individual to individual. At the extreme, the space needed to house a single, major piece of equipment may fill a complete building (as for example, a building which houses an accelerator). At the other extreme, the additional space requirements may be limited to a very few square feet.

Not only do research space requirements vary widely, but these requirements are changing continuously. As technology changes, the amount of space required to perform the same tasks may change. The very nature of the research activity requires that such changes occur.

In light of these wide variations and changing conditions, it is obvious that the determination and projection of detailed non-class lab space needs is impossible. At best, the planner can hope only to calculate (or approximate) the total amount of such space which will be required on a discipline-by-discipline basis at some point in the future. For such purposes, rules of thumb can be developed.

The detailed planning process is a meaningless exercise until such time as programming for a new building is actually begun. At that time there is reason and need to determine specific space requirements for specific projects and for identified research activities within the discipline(s) for which additional space is to be provided.

DISCUSSION

DETAILED METHOD

PROJECTION OF RESEARCH FACILITIES

In actuality there is no detailed method for generating estimates of non-class laboratory requirements which is used only as part of the planning process. Although the general planning method (which yields the total non-class lab space required for each department) leaves something to be desired, it is the only technique available which stops short of necessitating the development of a room-by-room building program statement for all such facilities.

The absence of such methodologies accurately reflects the realities and practicalities of the situation. In general, long-term planning requires nothing more than the generalized results which the general planning method yields. Short-term management (that is, management of space within a time frame too short to allow solution of problems by the simple expedient of adding space) is accomplished in reaction to specific needs of particular projects. As a result, the detailed method of planning which is associated with non-class laboratories has little application except in conjunction with a construction program. One of the results of this arrangement is a situation in which planning in detail is accomplished only for a few selected departments at any one time.

Since the detailed planning process is so closely tied to building programming, it results in a very explicit plan. In addition, the process by which such plans are developed is considerably different in many respects than the processes used for other types of facilities.

A department's need for additional non-class lab space can be made evident in several ways. The general planning method is particularly useful in isolating those departments which are projected as having marked excesses or deficiencies of space. By determining the needs which cannot be alleviated by reallocation of space, a basic list of additional research laboratory requirements can be established. Similarly departments which will have insufficient laboratory space to carry out their research activities can be identified on the basis of present shortages compounded by projections of an expansion of such activities. Under such conditions, obvious current space management problems or vocal faculty members will aid in pin pointing the departments which are operating with less than the required amount of non-class laboratory space. Reliance on the latter technique has the advantage of simplicity. On the other hand, it also has the overriding disadvantage of responding to problems only after they have become fully visible. Regardless, as a result of either the political or the generalized planning processes of an institution, detailed planning of the non-class laboratory needs in selected departments will be indicated. No attempt will be made to describe each of the steps in this process; it varies so greatly from institution to institution that any such attempt is foredoomed to failure. Instead, the following paragraphs will attempt to describe the spirit and the flavor of the process.

The detailed determination of non-class laboratory requirements is probably more heavily dependent on user input than is the planning of any other type of space. The faculty member whose equipment and activities are to be accommodated within a laboratory plays the major role in determining the physical characteristics (including size) of the laboratory. Although architects and institutional facilities planners, with no faculty involvement, may be competent to design general classrooms, faculty offices, and many class laboratories with a minimum amount of direction, they cannot do the same with regard to specialized research facilities. If such facilities are to serve adequately the purposes for which they were intended, the user must be consulted thoroughly during the planning process.

This dependence on the faculty member for guidance has several ramifications. First, it very often results in an interesting bit of by-play between the faculty member and the administrators charged with controlling project costs. Because there are no reliable yardsticks available by which one can identify excessive requests, planning a specific laboratory rapidly becomes an exercise in large group negotiation. Facilities limitations are drawn on the basis of funding availability; space planning is carried on within these limitations. Conflicting demands for limited dollars may tend to insure that, in the end, the detailed plans do not result in drastic excesses or shortages in any given laboratory or group of laboratories.

A more serious ramification of this method of facilities planning is the shortened time horizon for which the resulting plans are applicable. Such planning tends to reflect the needs of current research projects to the exclusion or detriment of future needs. In cases in which the planning takes expanding or changing needs into consideration, these needs are the first ones to be abandoned in the face of funding limitations. Although this often results in a facility which rapidly becomes functionally obsolescent, there is considerable doubt that the process can be improved significantly and its disadvantages eliminated. As long as the activities housed within these facilities are change oriented by definition, there must be an expectation of continually changing facilities needs.

The end result of the detailed planning process for non-class laboratories and related service areas is a room-by-room specification of size and other physical characteristics of the laboratories required to fulfill the needs of a specific department or group of departments.

DISCUSSION
GENERAL PLANNING METHOD
PROJECTION OF RESEARCH FACILITIES

DATA TO BE DETERMINED:

- Assignable square feet of research space by department.

PROGRAM DATA REQUIRED:

- Projected number of headcount faculty and graduate students by department

FACILITIES DATA REQUIRED:

- Non-class laboratory space by department

ASSUMPTIONS REQUIRED:

- Percentage of the number of faculty and graduate students to be involved in research.
- Assignable square feet of non-class laboratory space per average researcher in each discipline.

PROCEDURE:

1. Obtain from the program planning procedure (see Manual Six, Section 3.0) a distribution of the projected numbers of headcount faculty and graduate students by department.

   The General Planning Method is based on the proposition that an individual's requirement for research space is dependent on his mere involvement in research, rather than on the extent of his involvement, and that the amount of space required varies by discipline. Use of this technique allows the planner to approximate the total non-class laboratory needs associated with each of the academic departments. This method is based on broad (averaged) factors and is not sensitive to the large number of variations which occur from project to project.

2. Estimate the proportion of and calculate the numbers of faculty and graduate assistants expected to be engaged in research.

   The estimation of the proportion of each of the primary user groups expected to be engaged in research is not difficult for an institution's chief academic officer or for most department chairmen. Given data on numbers (or proportions) of the graduate students and faculty of each department currently engaged in research, it is a relatively easy matter to estimate future conditions by either assuming a constant proportion or by making specific modifications to current factors.

3. Establish as a matter of institutional practice and/or external criteria the average number of non-class laboratory assignable square feet per average researcher for each department.

   Specifying the (non-class laboratory assignable square feet per researcher) factors which form the basis for estimating the total research lab needs of the various departments is an extremely difficult task. For the most part, the instability and variability of non-class lab needs has worked against the development of such factors. The degree of difference in the factors which have been developed attest to this variability. Section 5.0 in Manual Six includes a list of suggested planning criteria for non-class laboratory space. Judgment must be exercised at the institutional level to determine the appropriateness of the values.

4. Determine the total non-class laboratory assignable square feet required. This is the product of the projected number of head-count faculty and graduate students and the assumed average number of non-class laboratory assignable square feet per average researcher for each department.

EXAMPLE
GENERAL PLANNING METHOD
PROJECTION OF RESEARCH FACILITIES

DATA TO BE DETERMINED:

- Assignable square feet of research space by department.

PROGRAM DATA REQUIRED:

- Projected number of headcount faculty and graduate students by department.

FACILITIES DATA REQUIRED:

- Nonclass laboratory space by department.

ASSUMPTIONS REQUIRED:

- Percentage of the number of faculty and graduate students to be involved in research.
- Assignable square feet of non-class laboratory space per average researcher in each discipline.

PROCEDURE:

1. Obtain from the program planning procedure (see Manual Six, Section 3.0) a distribution of the projected numbers of headcount faculty and graduate students by department. (See Table 3.21).
2. Estimate the proportion and calculate the numbers of faculty and graduate assistants expected to be engaged in research. (See Table 3.22).

TABLE 3.21

PROJECTED HEADCOUNT FACULTY AND GRADUATE ASSISTANTS BY DEPARTMENT

ACADEMIC DEPARTMENT	PROJECTED HEAD COUNT FACULTY	PROJECTED GRADUATE STUDENTS
1. Biology	7	6
2. Zoology	5	6
3. Mathematics	10	8
4. Chemistry	7	4
5. Geology	5	1
6. Physics	7	3
7. English	15	-
8. Fine Arts	22	-
9. Philosophy	12	-
10. Classics	2	-
11. Languages	12	8
12. Political Science	12	-
13. History	14	8
14. Economics	8	-
15. Sociology	7	-
16. Business	11	-
17. Education	7	-
18. Physical Education	9	-
Totals	172	44

TABLE 3.22

ESTIMATED PROPORTIONS AND HEADCOUNT NUMBER OF FACULTY AND GRADUATE ASSISTANTS IN RESEARCH

DEPARTMENTS	ESTIMATED PERCENTAGE OF FACULTY IN RESEARCH (1)	TOTAL HEAD-COUNT FACULTY (2)	ESTIMATED HEADCOUNT OF FACULTY IN RESEARCH (1) x (2) = (3)	ESTIMATED PERCENTAGE OF GRADUATE ASSISTANTS IN RESEARCH (4)	TOTAL HEADCOUNT GRADUATE ASSISTANTS (5)	ESTIMATED GRAD. ASSISTANTS IN RESEARCH (4) x (5) = (6)
1. Biology	70%	7	5	50%	6	3
2. Zoology	60%	5	3	50%	6	3
3. Mathematics	60%	10	6	62%	8	4
4. Chemistry	85%	7	6	75%	4	3
5. Geology	40%	5	2	100%	1	1
6. Physics	100%	7	7	100%	3	3
7. English	-	15	-	-	-	-
8. Fine Arts	-	22	-	-	-	-
9. Philosophy	-	12	-	-	-	-
10. Classics	-	2	-	-	-	-
11. Languages	-	12	-	-	8	-
12. Political Science	-	12	-	-	-	-
13. History	-	14	-	-	8	-
14. Economics	50%	8	4	-	-	-
15. Sociology	-	7	-	-	-	-
16. Business	-	11	-	-	-	-
17. Education	28%	7	2	-	-	-
18. Physical Education	-	9	-	-	-	-
Totals	-	172	35	-	44	17

3. Establish as a matter of institutional practice and/or external criteria the average number of non-class laboratory assignable square feet per average researcher for each department.

TABLE 3.23

AVERAGE NUMBER OF NON-CLASS LABORATORY ASSIGNABLE SQUARE FEET PER AVERAGE RESEARCHER FOR EACH DEPARTMENT

DEPARTMENTS	AVERAGE NON-CLASS LABORATORY ASSIGNABLE SQUARE FEET PER AVERAGE RESEARCHER*
1. Biology	230 ASF/Researcher
2. Zoology	280 ASF/Researcher
3. Mathematics	75 ASF/Reseracher
4. Chemistry	300 ASF/Researcher
5. Geology	275 ASF/Researcher
6. Physics	310 ASF/Researcher
7. Economics	70 ASF/Researcher
8. Education	50 ASF/Researcher

*Not to be construed as recommended values. Factors are for illustrative purposes only.

4. Determine the total non-class laboratory assignable square feet required. This is the product of the projected number of headcount faculty and graduate students and the assumed average number of non-class laboratory assignable square feet per average researcher for each department. (See Table 3.24).

TABLE 3.24

TOTAL NON-CLASS LABORATORY ASSIGNABLE SQUARE FEET PER DEPARTMENT

DEPARTMENTS	ESTIMATED HEADCOUNT FACULTY IN RESEARCH (1)	AVERAGE ASF/ AVERAGE RESEARCHER (2)	ASF IN RESEARCH (1) x (2) = (3)	ESTIMATED HEADCOUNT GRAD. ASSISTANTS IN RESEARCH (4)	AVERAGE ASF AVERAGE RESEARCH (5)	ASF IN RESEARCH (4) x (5) = (6)	TOTAL ASF IN RESEARCH (3) x (6) = (7)
1. Biology	5	230	1,150	3	230	690	1,840
2. Zoology	3	280	840	3	280	840	1,680
3. Mathematics	6	75	450	4	75	300	750
4. Chemistry	6	300	1,800	3	300	900	2,700
5. Geology	2	275	550	1	275	275	825
6. Physics	7	310	2,170	3	310	930	3,100
7. Economics	4	70	280	-	70	-	280
8. Education	2	50	100	-	50	-	100
Totals	38	-	7,340	17	-	3,935	11,275

UNIT FLOOR AREA CRITERIA

ROOM TYPE:	Research Space
ROOM TYPE CODES:	250 Non-Class Laboratory 255 Non-Class Laboratory (310 Office) (315 Office Service)

DISCUSSION:

Commonly published figures for Research Space such as assignable square feet per researcher or assignable square feet per academic FTE are valid usually for planning purposes but have little relevance for the actual configuration of a research space. Generally the area of a research laboratory is a function of the equipment necessary for the operation. Therefore, it would be misleading as well as extremely difficult to tabulate unit floor area criteria outlined

tabulate unit floor area criteria for research laboratories on the basis of equipment space allowances. There is virtually no universally applicable design criteria for research space. It is suggested that planning criteria

design criteria for research space. It is suggested that planning criteria

be used to project future research space needs. However, current research space requirements will need to be determined on the basis of individual project needs. Most often these needs will be functions of the equipment rather than the people involved.

INTRODUCTION TO MANUAL FOUR
ACADEMIC SUPPORT FACILITIES

The types of Academic Support facilities covered in Manual Four include:

Libraries and other study facilities;

Museum, gallery, and other exhibition facilities;

Audio-visual facilities;

Computing facilities.

The grouping of the room types included in this manual follows the Academic Support Program categories in the WICHE Program Classification Structure (preliminary edition, 1970).* In general, these academic support functions have similar objectives and purposes--the preservation, maintenance, transformation, retrieval, and display of recorded knowledge. In varying degrees, these types require facilities which perform the following functions:

1. Storage of the media by which information is recorded and preserved. The media include printed materials and manuscripts, works of art, artifacts, natural objects, motion pictures, video tape, photographs, slides, microform, audio recordings, punched cards, and data recorded in electromagnetic form.
2. Use of the media by students, faculty, staff, and the public. User facilities range from reading tables, listening booths, microform readers, and study carrels to art gallery concourses, television sets, keypunch machines, and computer terminals. In most cases, provision is made for the user facilities in close conjunction with the stored material or equipment needed. Increasingly, however, remote terminals, television, and facsimile reproduction devices permit the physical separation of the user and the original stored material.

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*A fifth category under the Academic Support Program in the Program Classification Structure is "Ancillary Support," e.g., laboratory schools and teaching hospitals. These types of facilities are not dealt with specifically in this manual.

3. Management and services of the academic support operation. The acquisition, processing, cataloging, and maintenance of the media requires staff offices, working facilities, and space for specialized equipment. User advisory services and the processes of location, retrieval, display, and reproduction of library holdings for the user also require staff offices, work areas, and specialized equipment. In addition, the maintenance of the equipment used for processing, retrieval, and reproduction of the stored information may create the need for substantial space in an academic support facility, such as an audio-visual center.

   Within these general similarities of function, libraries, museums and galleries, audio-visual services, and computing services vary widely in the nature of their facilities requirements. Nevertheless, the form of evaluation and projection generally involves consideration of

   - units to be stored;
   - users to be served;
   - staff to be accommodated; and
   - special equipment requirements not accounted for in the storage, user, or service components.

In the following sections, the methods for evaluating existing facilities capacity and projecting future requirements will follow this general form.

LIBRARY AND OTHER STUDY FACILITIES

ROOM TYPES INCLUDED:
- Study Room
- Stack
- Open-Stack Reading Room
- Library Processing Room*
- Study Facilities Service*

DISCUSSION:

Normally, the study facilities of a college or university are planned within the framework of the library as an organizational unit. To an increasing extent, however, study facilities are provided in other locations, especially in residence halls and student centers. These extra-library study facilities should be taken into account in the evaluation and planning of the overall needs for private and group study facilities. In this discussion, the primary focus will be on the library as an entity, composed of storage, user, and library services facilities.

In size, content, scope of functions, and degrees of specialized services, the range of variance among libraries is as great as the range of program characteristics among colleges and universities of various types and sizes. It is useful to think of the size and content of the library as being generally associated with the size and composition of the academic programs of the institution, but some small, older liberal arts colleges have larger and more comprehensive libraries than many newer public universities.

The size of collections in existing institutions is a function of time and rates of acquisition and removal. Projections will depend upon the resources that will be available for acquisitions, the costs of acquiring and processing of new materials, and the costs of removing obsolete material. On the spectrum ranging from the community college with a strong vocational-technical orientation to the long-established university research library, annual rates of acquisition will range from a few hundred to over 200,000 volumes. The scope of the subject matter will vary accordingly.

A variety of formulae have been put forth in an attempt to gauge the desirable size of collections according to student population and composition, number of degree programs, and similar factors. The American Library Association recommends a formula, viewed by many as generous, based on weighted enrollments by level of student and on numbers of faculty. A number of states have adopted the formula proposed by Clapp and Jordan (1965). A modification of this formula developed in the state of Washington is used in the example given in Section 2.11. Some states have developed their own criteria for estimating the size of library collections for different types of institutions.

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*In addition, Office and Office Service facilities within the organization unit Library are included in the detailed methods.

The number of readers to be accommodated simultaneously in the library and other study facilities also varies widely with the size and program characteristics of the institution. The California Coordinating Council for Higher Education (1966) proposed for community colleges with more than 10 per cent of the instructional load in "trade-technical" courses, that only 15 per cent of the full-time student enrollment be provided library reader stations at one time. On the other extreme, a highly-selective, private university recently programmed new library facilities to accommodate 40 per cent of the undergraduate full-time students and 50 per cent of those graduate students for whom resources were housed in the central library. The high proportion for undergraduates was based on the fact that this university, on a four-course curriculum, required very extensive reading and research work of its undergraduates in all courses. A surprising number of states have accepted a general planning criterion of 25 per cent of the full-time equivalent students as the number of reader stations to be provided in the library. (Ashley and Romney, 1970).

The staffing requirements of a library will vary with:

- the rates of acquisition and processing,
- the scope and degree of specialization of user services offered, and
- the administrative staff requirements as related to the magnitudes of the first two.

In general, the space required for library services and management tends to vary directly with the size of collections and the number of users served. As a result, many states have adopted the general planning criterion that library space (including staff offices) will equal 25 per cent of the combined assignable floor area required for stack storage and reader facilities.

In the evaluation of existing library facilities and the projection of future library requirements, certain kinds of variations should be expected and taken into account. The variations will occur primarily in the projected number of volumes to be stored, readers to be served, and staff to be provided office and work space.

The floor area units, on the other hand, are reasonably similar for all types of libraries:

- Stack ranges (single face) typically require between 8.3 and 9.0 assignable square feet per unit (typically assumed to accommodate between 100 and 125 volume equivalents per range).
- Reader stations vary according to type, with an average of 18 to 20 assignable square feet per station required in large reading rooms with tables; 30 assignable square feet for open carrels and microform reader stations; 45 to 48 assignable square feet for enclosed carrels; and 48 to 70 assignable square feet for faculty stations.
- Staff work stations or offices will vary from 75 assignable square feet in large, open technical processing areas to 150 assignable square feet in single-occupancy professional offices.

The most difficult aspect of library planning and evaluation is the determination of program characteristics appropriate for a given institution; the size and type of the collections, the intensity of reader use, and the scope of staff service requirements. These are matters of institutional policy and program goals.

DISCUSSION

DETAILED METHOD

EVALUATION OF EXISTING LIBRARY AND OTHER STUDY FACILITIES CAPACITY

DATA TO BE DETERMINED:

- The adequacy of existing library holdings
- The number of users that can be accommodated at one time in existing reader facilities, by type of user
- The volume equivalent capacities of existing stack and other storage facilities
- The adequacy of existing library service (processing) facilities (office and work areas)

DATA REQUIRED:

- The number of reader stations available, by type of station (tables, open carrels, enclosed carrels, faculty studies, microform readers, and audio-visual carrels)
- Assignable square feet of study space in library and other study facilities (including proration to study space from open-stack reading rooms)
- Volume equivalents of library material stored, measured either by
  - lineal feet of materials shelved or cased,
  - volume and piece count by type of material, or
  - number of stack ranges and cases filled.
- Assignable square feet in stacks, along with proration to stacks from Open-Stack Reading Rooms
- Number of library staff (administrative, professional, clerical, and other).

- Assignable square feet of Library Service (Processing) Rooms, and Study Facilities Service Rooms. (Optionally, the number of offices and work stations may be collected for more detailed evaluation)

PROGRAM DATA REQUIRED:

- Current student enrollment, both headcount and full-time equivalent, by level of student
- Full-time equivalent faculty, by academic specialty
- Number of undergraduate major fields
- Number of masters degree fields
- Number of doctoral degree fields

UTILIZATION ASSUMPTIONS REQUIRED:

- The ratio of available reader stations to the total full-time equivalent student enrollment, by type of user and type of station
- The expected assignable square feet of stack and other storage space per volume equivalent
- The expected assignable square feet of library service and office space as a percentage of the sum of reader and stack assignable square feet
- The expected unit floor area allowances for offices and work stations per staff member, by type of staff

DISCUSSION:

Evaluation of the Adequacy of Existing Library Holdings

The qualitative evaluation of the content of resources, presumably, is a continuing process of dialogue between the faculty, professional librarians, and students of a college or university.

Several formulas have been developed that purport to provide quantitative measures of the adequacy of library collections. Although none of these formulas are grounded on solid empirical evidence, they are reasonable constructs that are useful as points of departure in an evaluation.*

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*Recently, the application of systems analysis and operations research to libraries has shown promising results. In particular Raffel and Shishko (1969) and Morse (1968) have shown the potential of more rigorous analysis of the use of library collections and library operations. These have not yet reached the point of providing definitive guidelines for the evaluation of library procedures.

The Clapp-Jordan Formula (1965) has been widely used. For four-year colleges and universities, this formula is as follows:

(1) A basic undergraduate collection of 50,750 volumes

(2) For each FTE faculty member, add 100 volumes

(3) For each undergraduate student, add 12 volumes

(4) For each undergraduate major field, add 335 volumes

(5) For each masters degree field, add 3,050 volumes

(6) For each doctoral degree field, add 24,500 volumes

The Clapp-Jordan Formula has been criticized as being too low on the figure for the basic undergraduate collection.

The American Library Association Formula (ACRL, 1959, rev. 1969) weights the various user components by level to determine a "service load".

(1) Lower division students x 1 = Service load
Service load x 100 = Volumes required

(2) Upper division students x 3 = Service load
Service load x 50 = Volumes required

(3) Masters level students x 3 = Service load
Service load x 50 = Volumes required

(4) Doctoral level students x 4 = Service load
Service load x 75 = Volumes required

(5) Faculty x 5 = Service load
Service load x 75 = Volumes required

The sum of the volumes required in each category yields the total volumes recommended by American Library Association for an institution of a given current or projected size and student mix. The weighting factors are arbitrary and are simply intended to reflect the higher service loads generated as the academic level advances.

After extensive study, the four-year colleges and universities in the State of Washington (Office of Interinstitutional Business Studies, 1968, 1970) developed a modification of the Clapp-Jordan factors that is attracting considerable attention. The State of Washington approach defines "units of library resources" as the number of volumes reported in the Higher Education General Information

Survey plus a volume-equivalent factor for microforms.* (One reel of microfilm or eight microcards or microfiche as reported in HEGIS equals one unit of library resource). The Washington formula for determining minimum quantitative adequacy of holdings of library resources** is as follows:

(1)	Basic or Opening Day Collection	85,000 Units of Library Resources
(2)	Allowance per FTE Faculty	100 Units of Library Resources
(3)	Allowance per FTE Student	15 Units of Library Resources
(4)	Allowance per Masters Field When No Doctorate Offered in Field	6,100 Units of Library Resources
(5)	Allowance per Masters Field When Doctorate Is Offered in Field	3,050 Units of Library Resources
(6)	Allowance per Doctoral Field	24,500 Units of Library Resources

The application of all three of these formulas to a hypothetical institutional program, and the differing results, are illustrated in Table 4.1.

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*The HEGIS definition is, "For reporting purposes, a volume is a physical unit of any printed, typewritten, handwritten, mimeographed, or processed work contained in one binding or portfolio, hardbound or paperbound, which has been classified, cataloged or otherwise prepared for use. Include bound periodical volumes. Include government documents that have been classified and cataloged, counting as a volume such material as is contained in one binding or portfolio."

**Note: Laboratory or demonstration school libraries and law, health sciences, agriculture, and industrial research libraries are excluded from the Washington formula.

Judgmentally, the Clapp-Jordan formula, which yields the lower result, is viewed by many as providing a minimal collection; the ALA formula, giving the higher volume count, may be viewed as generous, if not maximal. The Washington formula falls midway between the two; since it was based on fairly careful testing of the Clapp-Jordan factors and subsequent modification, the Washington formula will be treated as optimal and will be used in the subsequent illustrations.

The Clapp-Jordan formula for community colleges probably should be viewed as minimal, as well. It would be most appropriate for a community college with a high proportion of technical-vocation instruction. The community college factors are as follows:

(1)	Basic collection for general education	16,875 volumes
(2)	For each FTE faculty member, add	51 volumes
(3)	For each FTE student (day and evening), add	5 volumes
(4)	For each subject field of study, add	165 volumes

Community colleges with heavier emphasis on the liberal arts and sciences and those with more mature library collections probably could justify a larger basic collection and a larger increment of volumes per student.

In all cases, these formulas do not account for the time dimension. Not only do older libraries have larger collections to begin with, they must keep up with the constantly emerging stream of published material essential to the fields of study covered in the institution. Even if the institution's population and programs remain constant, the continued acquisition of new material is to be expected, both to keep up with the expanding productivity of knowledge and to fill out gaps in the content of collections.

The removal of obsolete material in the collections occurs at a much lower rate than the rate of acquisition, perhaps only five or ten per cent. The largest and most advanced research libraries may remove one volume for every four added, but most smaller college libraries seem to remove material at a rate of about one volume for every 20 added. The costs of culling out obsolete materials is relatively high, and intensive housecleaning seems to occur only when there is an acute shortage of storage space.

These considerations must be taken into account when applying quantitative formulas such as those described above. The formulas may give an indication whether the library's acquisition rate should be higher, to catch up with the formula, or lower, if the collection exceeds the formula. But, basically, rates of acquisition are -- and should be -- dependent upon the needs of the academic programs and the resources available.

Evaluation of the Capacity of User Facilities

Although user facilities are not restricted to reader stations in library and other study facilities, the evaluation of user capacity usually is expressed as

$$\text{Proportion of User Population for which Reader Stations are Available} = \frac{\text{Reader Stations Available by Type}^{*}}{\text{Total User Population by Type}}$$

The result of this calculation can be compared with a general planning criterion such as the commonly used 25 percent of the full-time equivalent student population for whom stations will be provided.

Most college and university libraries will fall short of the 25 percent factor. As library holdings grow over time and as staff services expand with the growth of holdings, acquisition rates, and user populations, space originally assigned for readers gradually gets converted to book storage or services and processing space. Another factor which affects this percentage is the institution's attitude toward study facilities. If the library is viewed as the campus study hall, then more stations generally will be necessary. If other facilities such as classrooms are available for study purposes, then the percentage can be lower. As a general rule, if the proportion of reader stations to user population falls below 15 percent, the need for expansion of study facilities should be reviewed.

Even if the types of users and reader stations are differentiated quite precisely, the ratio of reader stations to user populations is only a gross indicator of need. More exhaustive and detailed surveys of reader station use have been attempted. Spot surveys of reader station occupancy at different times of the day, days of the week, and weeks of the academic term are useful from time-to-time for purposes of library management, evaluation of the quality of reader space, and evaluations of the need for additional reader facilities.

The following form illustrates the kind of survey of reader station use that could be made over a semester or quarter, selecting weeks over the term that will coincide with examination periods and interexamination periods. Whether the days of week and times of day are covered exhaustively or are sampled selectively, such a survey should be sufficiently extensive to reveal the varying patterns of library usage.

This kind of detailed survey should be viewed as a special institutional research project, carried out from time-to-time for management purposes, but not carried on continuously; the cost of making the survey is too great relative to the information returned. A detailed study of library use conducted every three or four years should be sufficient to assess changing patterns and needs.

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*Typical types of reader stations are tables, open carrels, enclosed carrels, faculty studies, microform readers, and audio-visual carrels.

Qualitative evaluation of reader areas is an important adjunct to quantitative evaluation. Evidence exists that smaller, more intimate study areas are preferred over large reading rooms; that individual carrels are more likely to be occupied before multi-station reading tables. A poor study environment--not uncommon in many college libraries--will reduce reader usage.

When study facilities are available outside the library, in residence halls, student centers, and classroom buildings, the need for reader stations in the library may be reduced. Studying in the library when there is no need to use library materials may be more frequent if noisy, double-room dormitories lack quiet study facilities or if commuting students are not provided with alternative study locations between classes.

The development of remote communications systems, still in its infancy, may be expected to decentralize reader use in some degree, but direct access to the original material probably will continue to be important to the library user.

SAMPLE FORM

DETAILED SURVEY OF READER STATION USE AND QUALITY

Building ______ Room No. ______ Room Type ______ Assignable Sq. Ft. ______ Stack ______ Readers ______

Reader Stations: Type ______ No. ______ % ____ Shelving Capacity: ______ Lin. Ft. ______ Volumes ______

Type ______ No. ______ % ____ Other Material: ______

Type ______ No. ______ % ____ Special Equipment: ______

Total No. ______ % 100 ______

Survey Time	Week in Term/Days of Week																												Analysis	
	Week: (2)							Week: (7)							Week: (10)							Week: (14)								
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	Sums	Means
7:30 a.m.																														
8:30																														
9:30																														
10:30																														
11:30																														
12:30 p.m.																														
1:30																														
2:30																														
3:30																														
4:30																														
5:30																														
6:30																														
7:30																														
8:30																														
9:30																														
10:30																														
11:30																														
Sums																														
Means																														
Ranges																														

Quality Evaluation: General Condition ______

Lighting ______ Ventilation ______ Traffic ______

Furniture quality and condition ______

[redacted]

Evaluation of the Capacity of Library Storage Facilities

The factors available for estimating the storage capacity for books and other library materials tend to be somewhat inconsistent. In part, this is due to the difficulty of defining a standard unit of "volume", and in part it is due to differences in the numbers of units that can be accommodated in a typical storage unit--the stack section.

The typical stack section is three feet wide, approximately 10 inches deep, and has seven shelves. If stack sections are ranged on 4'6" centers, allowing for circulation, a single stack range occupies an average of 8.33 assignable square feet. Assuming six volume-equivalents per linear foot of shelving, a stack section holds a maximum of 125 volumes. This would average 0.067 square feet per volume or, conversely, 15 volumes per square feet. (Metcalf, 1965.)

Most librarians argue that stacks should never be fully packed. If collections are packed, new additions cannot be added in the catalogue numbering sequence required without frequent and costly reshelving of whole collections and renumbering of stack ranges. Hence, the most common factor used is 10 volumes per square foot (0.10 assignable square feet per volume), or two-thirds of saturated shelving capacity. Apparently as some sort of compromise, many states have adopted a factor of 0.833 assignable square feet per volume (12 volumes per assignable square foot) as a standard guideline.

The translation of other forms of library materials into volume equivalents presents a special problem. Unbound materials, pamphlets, government documents, maps, records, tapes, and the various kinds of microform require different types of storage equipment. In the examples below, the conversion factors used by the University of California, related to stack-section equivalents, and the Illinois conversion factors, related to equivalent volumes, are shown.

In recent years, much attention has been given to compact storage of little-used but still valuable library materials. (See Ellsworth, 1969.) There is some evidence that the costs of compact storage are greater than the savings in capital investment required to expand normal, central stack storage (Raffel and Shishko, 1969). Certainly the operating costs of selection, removal, recataloging, transportation, and retreival should be carefully considered before a major move toward compact storage is attempted. In many cases, delays in the construction of new library facilities force the alternative of compact storage or the removal of duplicate and obsolete material.

Clearly, the time required for the planning, design, and construction of new or expanded library facilities is such that the evaluation of current capacity must go hand-in-hand with the projection of library growth at least five years ahead. Net acquisitions (total annual acquisitions less removed and lost items), determined by budget resources, staff processing capacity, and available storage capacity in the short-run, and by academic program goals and needs in the long-run, are an essential part of the evaluation of existing storage capacities.

Evaluation of Library Service Facilities

Library service areas are a combination of administrative and staff offices and work areas, public areas, and the fixtures and equipment required for processing and user services.

The following are the major components of library service operations and the relationships of these components to the various types of workload indicators:

(1) Acquisitions: The selection, ordering, and initial receipt of materials is generally a function of the rate of acquisitions. Professional and clerical staffing will vary with the volume of acquisition. These relationships are being altered by increased automation and by the use of pooled acquisition and cataloging by groups of libraries. Equipment becomes a key space consumer as automation increases.

(2) Cataloging: The recording of acquisitions, cataloging, and entry into the stacks of new materials also is primarily a function of the acquisition rate. Cataloging becomes more expensive as the amount of foreign language and highly technical material increases. Again, the use of automation and pooled cataloging services (such as the Library of Congress services and regional library groupings) are being used to increase the productivity of the cataloging process. Extensive reshelving and removal of material increases staffing requirements. Storage of the catalogs in card files and bound volumes is a major factor in determining space requirements.

(3) Circulation: The workloads of retrieval and recording of circulated material probably increases both with the number of users and the size of the collection.

(4) Interlibrary Loan: Staffing for this function as a user service is dependent primarily upon the research activities of the faculty and graduate students. In a large research library, demands on interlibrary loan from other institutions and external agencies is a significant factor.

(5) Reference: Staffing of reference services primarily depends upon the numbers of users. The type of academic program may demand a higher level of reference service. Undergraduate programs requiring substantial student research work, graduate programs, and faculty activity in research and scholarly work increase the demand for reference services. In some institutions, public use of reference service may be heavy.

(6) Reserve: Staffing of reserved book collections depends primarily on the size of the undergraduate population. Institutions whose faculties make heavy use of the reserve system for course reading material must staff the reserve desk more heavily and add clerical assistance when reserve materials are changed from term-to-term.

(7) Binding and Mending: If bindery operations are conducted within the library, substantial work station and equipment areas must be provided. Staffing depends upon the number of periodicals and serials to be handled. The rates of rebinding and mending will vary with the age of materials and intensity of use.

(8) Receiving and Mailing: The size of staff and work areas required will depend on the combined magnitudes of acquisitions and interlibrary loan activities.

(9) Other: Staff lounges and locker facilities clearly depend of the size of the staff. Reproduction services depend on user demand. Microfilming operations, the conversion of hardcopy books, papers, and documents to microfilm, may be extensive in some libraries, requiring substantial staff and equipment space. Computer facilities in libraries are appearing as significant space consumers.

The determination of the adequacy of staffing of the library, given the many variables suggested above, depends on the administrative evaluation of the nature of the given library and its services within the institutional context.

The space required for a given level of staffing can be reduced to office or station requirements. The most detailed breakdown of work station floor area requirements has been developed by the University of California. These are used in the illustrations that follow.

The general planning criteria for library service space range from 19 to 20 percent of the combined reader and storage floor area in larger libraries to 25 percent in smaller libraries. These factors have been derived empirically from actual libraries that are judged to have adequate service facilities.

With the technological changes and the growth of cooperative efforts in technical processing, the service component may be reduced in the future. So far, however, automation seems to increase the space required for the service functions of the library; the machines require as much or more space than the people they are supposed to replace (but rarely do).

PROCEDURE:

1. Obtain an inventory of current library holdings by type of holding.

   Typically, such an inventory is maintained by the head librarian. It may be that this inventory is kept in terms of volume equivalents. If not, it will be useful to make the conversion since volume equivalents are useful for subsequent, evaluative calculations. These data are reported annually to the American Library Association and in the Higher Education General Information Survey.

2. Obtain from the program planning procedure (See Sections 2.0 and 3.0 of Manual Six) a tabulation of the number of current FTE students, number of undergraduate level major programs, masters level major degree programs, doctoral level major programs, and the number of FTE faculty.

3. Calculate the suggested number of holdings, given the number of FTE students, FTE faculty, undergraduate major programs, and graduate major programs.

   As explained in the DISCUSSION, the suggested number of holdings can be calculated in a variety of ways, three of which were outlined. The discrepancy in the results issues from the lack of definition as to what constitutes a "volume". Before the institutional planner selects a method to calculate the suggested number of holdings, he should be certain of the definitions as well as of the intent and implications of the techniques.

4. Compare current library holdings with the suggested number of holdings, calculate the difference, and make a judgment as to the adequacy of present library holdings.

   This step is simply a matter of determining the number of volumes which the current holdings are deficient or in excess when compared with the results of the previous step. It can also lead to a determination of what the acquisition rate should be over the next few years to make up any deficiency which exists in the number of library holdings.

5. From the facilities inventory, determine the number of assignable square feet of current library space, by type of space, and the number of existing stations, by type of station.

   The level of detail to which this inventory goes is a matter of institutional concern. However, it should be noted that the various types of stations in a library, because of the nature of the tasks involved, require widely varying amounts of space. A proper evaluation of current needs requires that the various types of service and user stations be inventoried by type of station. Often it is difficult to make a distinction between reader space and stack space since it is common to combine the two. For analysis and evaluation purposes, however, it will be useful to make the distinction in order to evaluate properly the volume holding capacity of the stacks. Often the distinction is made on the basis of a proration of the room type "Open-Stack Reading Room" to reader stations and stack space.

6. Determine the number of users, by type of user, that can be accommodated at one time in existing facilities.

   The number of users by type of user that can be accommodated at one time in existing facilities is determined by the number of user stations of each type available. It is helpful to determine not only the number of users but also the percentage of each user group to be accommodated.

7. Establish as a matter of institutional policy for each type of holding the volume equivalent allowance in assignable square feet.

   Care must be exercized in this step because, as mentioned in the text, volume holding allowances are based on different approaches to stack arrangements and shelf density. Some volume holding allowances are based on saturation considerations. The volume holding allowances given in Step 7 of the PROCEDURE are of this type. Others are more lenient and make allowances for expansion without the need to re-shelve collections.

8. Determine the volume equivalent capacity required for the current number of holdings.

   The volume equivalent capacities are the mathematical product of the volume holding allowances and the number of existing volumes.

9. As a matter of institutional policy, select work station assignable square feet allowances for each type of work station in the library, compare them with existing assignable square feet, and calculate the differences.

Work station assignable square feet allowances typically include allowances for the entire set of activities associated with the particular work stations, not just the work station itself. This is why the allowances may vary from as high as 250 to 260 assignable square feet for a binding preparation work station to 115 to 125 assignable square feet for a reference collection work station to 25 to 30 assignable square feet for a station in a staff room. Calculation of the difference between suggested and existing service facilities is merely an evaluation of the adequacy of existing space, given the existing number of work stations.

10. Evaluate the adequacy of existing library service facilities.

This step is designed to promote the evaluation of service facilities in comparison to the total amount of stack and study space, which is the generally accepted technique for evaluating and determining requirements for such space. If the existing amount of library service facilities falls below a certain percentage of the existing stack and study space, then indications are that there is need for more service space. Usually, this percentage ranges from 20% to 25% depending on the size of the library and library administrative policies. As a general rule, the larger the library the lower this percentage can become.

EXAMPLE
DETAILED METHOD
EVALUATION OF EXISTING LIBRARY AND OTHER STUDY FACILITIES

DATA TO BE DETERMINED:

- The adequacy of existing library holdings
- The number of users that can be accommodated at one time in existing reader facilities by type of user
- The volume equivalent capacities of existing stack and other storage facilities
- The adequacy of existing library service (processing) facilities (office and work areas)

PROCEDURE:

1. Obtain an inventory of current library holdings by type of holding.

TABLE 2.1

CURRENT LIBRARY HOLDINGS BY TYPE OF HOLDING
CONVERTED TO VOLUME EQUIVALENTS

TYPE OF HOLDING 1	NUMBER OF ITEMS 2	VOLUME * EQUIVALENT FACTOR 3	VOLUME EQUIVALENTS 4 = (2) x (3)
1. Bound Volumes	367,664	1.00	367,664
2. Documents & Pamphlets	60,842	0.10	6,084
3. Microfilm Reels	5,755	0.29	1,669
4. Newspaper Titles-Unbound	52	14.29	743
5. Newspaper Titles-Bound	428	14.29	6,116
6. Periodicals-Unbound	350	1.00	350
7. Periodicals-Bound	14,181	1.00	14,181
8. Records (Recording)	3,864	0.20	773
Totals	453,136 Items	----	397,580 Volume Equivalents

*Bareither, Harlan and Goins, Thomas. SPACE UTILIZATION MANUAL. Washington, D. C.; Division of College Facilities, United States Office of Education, 1968.

2. Obtain from the program planning procedure (See Sections 2.0 and 3.0 of Manual Six) a tabulation of the current number of FTE students, number of undergraduate majors, masters level majors, doctoral level majors, and the number of FTE faculty.

TABLE 2.2

TABULATION OF CURRENT FTE STUDENT BODY,

MAJORS OFFERED BY LEVEL, AND THE NUMBER OF FTE FACULTY

CATEGORY	NUMBER
Student Body - Lower Division	1,800 FTE
- Upper Division	1,200 FTE
- Masters Level	700 FTE
- Doctoral Level	300 FTE
Total	4,000 FTE
Faculty	300 FTE
Programs - Undergraduate Level	45 majors
- Masters Level	20 majors
- Doctoral Level	10 majors

3. Calculate the suggested number of holdings, given the number of FTE students, FTE faculty, undergraduate major programs, and graduate major programs.

a. Clapp-Jordan Formula

TABLE 2.3

CLAPP-JORDAN FORMULA

CATEGORY (1)	ALLOWANCE (2)	NUMBER (3)	VOLUMES (4)=(2)x(3)
Basic Undergraduate Collection	---	---	50,750
FTE Faculty	100 volumes/ FTE faculty	300	30,000
Undergraduate Student	12 volumes/ undergraduate	3000	36,000
Undergraduate Major Field	335 volumes/ undergraduate major	45	15,065
Masters Degree Field	3050 volumes/ masters degree field	20	61,000
Doctoral Degree Field	24,500 volumes/ doctoral degree field	10	245,000
Total	---	---	437,825 volumes

b. American Library Association Formula

TABLE 2.4
AMERICAN LIBRARY ASSOCIATION FORMULA

TYPE OF USER	NUMBER (1)	WEIGHT (2)	SERVICE LOAD UNITS (1)x(2)=(3)	VOLUMES PER SERVICE LOAD (4)	ESTIMATED VOLUMES REQUIRED (3)x(4)=(5)
Lower Division	1,800	1	1,800	100	180,000
Upper Division Student	1,200	2	2,400	50	120,000
Masters Level Students	700	3	2,100	50	105,000
Doctoral Level Students	300	4	1,200	75	90,000
Faculty	300	5	1,500	75	112,500
Total	-	-	-	-	607,500

c. State of Washington Formula*

TABLE 2.5

STATE OF WASHINGTON FORMULA

CATEGORY	ALLOWANCE
Basic or opening day collection	85,000
300 FTE faculty times 100 volumes per FTE faculty	30,000
4000 FTE student times 15 volumes per FTE student	60,000
10 masters fields with no doctorate in the field times 6100 volumes	61,000
10 masters field with doctorates in the field times 3,050 volumes	30,500
10 doctoral fields 24,500 volumes per doctoral field	245,000
Total	511,500 Volumes

*The State of Washington's method is given in terms of "units of library resources" which are equated to volumes for the purposes of this EXAMPLE.

4. Compare current library holdings with the suggested number of holdings, calculate the difference, and make a judgment as to the adequacy of present library holdings.

TABLE 2.6

COMPARISON OF CURRENT HOLDINGS WITH SUGGESTED HOLDINGS

Clapp-Jordan Formula	ALA Formula	State of Washington Formula
437,825 - volumes	607,500 - volumes	511,500 - volumes
397,580 - current volumes	397,580 - current volumes	397,580 - current volumes
40,580 - volumes deficient	209,920 - volumes deficient	113,920 - volumes deficient

Current library holdings appear to be slightly to significantly inadequate, depending on the formula used to calculate the adequacy of the number of library holdings.

If the State of Washington formula were accepted, acquisition would have to be increased by 22,000 volumes per year over five years to overcome the current deficiency.

5. From the facilities inventory, determine the number of assignable square feet of current library space, by type of space, and the number of stations, by type of station.

TABLE 2.7

INVENTORY OF CURRENT LIBRARY FACILITIES

TYPE OF SPACE	TYPE OF STATIONS	ASSIGNABLE SQUARE FEET	NUMBER OF STATIONS BY TYPE
Reader Space*		--	--
	Undergraduate Tables	12,140 ASF	480 Stations
	Graduate Carrels	12,606 ASF	280 Carrels
	Faculty Carrels	3,617 ASF	60 Carrels
	Microfilm Reader Stations	765 ASF	30 Stations
	Subtotal	29,128 ASF	850 Stations
Stack Space	---	43,762 ASF	--
Service Space			
	Acquisitions	994 ASF	10 Stations
	Administration	607 ASF	5 Stations
	Bindery Preparation	964 ASF	4 Stations
	Catalog	2,165 ASF	20 Stations
	Circulation	1,440 ASF	12 Stations
	Conference Room	414 ASF	20 Stations
	Documents	600 ASF	5 Stations
	Inter-Library Loan	286 ASF	3 Stations
	Marking and Mending	180 ASF	2 Stations
	Periodical	625 ASF	5 Stations
	Photocopy	220 ASF	2 Stations
	Receiving and Mail	1,152 ASF	4 Stations
	Reference	722 ASF	6 Stations
	Reserve Book	590 ASF	6 Stations
	Serials	720 ASF	6 Stations
	Special Collections	208 ASF	2 Stations
	Staff Rooms	396 ASF	18 Stations
	Subtotal	12,283 ASF	130 Stations
—	Total	85, 173 ASF	--**

*Computed from Room Types "Study Room" and a proportion of "Open-Stack Reading Room" allocated to reader stations.

**The total number of stations is not calculated because of the two different kinds of stations involved (user and work stations).

6. Determine the number of users, by type of user, that can be accommodated at one time in existing facilities.

TABLE 2.8

NUMBER OF USERS BY TYPE OF USER* THAT CAN BE ACCOMMODATED IN EXISTING LIBRARY FACILITIES

TYPE OF USER (1)	TOTAL NUMBER (2)	NUMBER* ACCOMMODATED (3)	PERCENTAGE OF TOTAL (4)=(3)÷(2)
Undergraduate	3,000	510**	17%
Graduate	1,000	280	28%
Faculty	300	60	20%
Total	3,400	850	25%

* The number of users who can be accommodated at one time is equal to the number of stations of that type available.

**Includes the microfilm reader stations.

7. Establish as a matter of institutional policy for each type of holding the volume equivalent allowance in assignable square feet.

TABLE 2.9

VOLUME EQUIVALENT ALLOWANCE FOR EACH TYPE OF HOLDING

TYPE OF HOLDING	VOLUME EQUIVALENT* ALLOWANCE
Volumes	8.7 ASF per each 125 volumes
Documents and Pamphlets	8.7 ASF per each 1000 documents and pamphlets
Microfilm Reels	8.7 ASF per each 400 reels of microfilm (boxed)
Newspaper Titles - Unbound	8.7 ASF per each 7 newspaper titles
Newspaper Titles - Bound	8.7 ASF per each 9 newspaper volumes
Periodicals - Unbound	15.0 ASF per each 15 periodical titles
Periodicals - Bound	8.7 ASF per each 30 periodical volumes
Records (Recordings)	8.7 ASF per each 500 records

*Taken from California Facilities Planning Guide for Higher Education, Appendix B.19.

8. Determine the volume equivalent capacity required for the current number of holdings.

a. Method A - Comparison of existing stack assignable square feet with required number of assignable square feet based on volume holding allowances. This method is based on saturation capacities.

TABLE 2.10

REQUIRED ASSIGNABLE SQUARE FEET OF STACK CAPACITY TO ACCOMMODATE CURRENT HOLDINGS

TYPE OF VOLUME (1)	NUMBER OF VOLUMES (2)	VOLUME ALLOWANCE (3)	REQUIRED ASF (4)=(2)x(3)
Volumes	367,664	8.7 ASF/125 Volumes	25,589 ASF
Documents and Pamphlets	60,842	8.7 ASF/1000 docs. & pamphlets	529 ASF
Microfilm Reels	5,755	8.7 ASF/400 reels (boxed)	125 ASF
Newspaper Titles - Unbound	52	8.7 ASF/7 titles	65 ASF
Newspaper Titles - Bound	428	8.7 ASF/9 volumes	414 ASF
Periodicals - Unbound	350	15.0 ASF/15 titles	350 ASF
Periodicals - Bound	14,181	8.7 ASF/30 volumes	4,113 ASF
Records (Recordings)	3,864	8.7 ASF/500 records	68 ASF
Total	453,156 Volumes	---	31,253 ASF

Use of the California volume holding allowances indicate that there remain 12,509 ASF of usable stack space in the existing library. If the total volume allowance of .068 ASF/Volume (31,253 ASF ÷ 453,156 Volumes) is applied to the remaining 12,509 ASF, then there would appear to be sufficient stack space for an additional 181,377 volumes (acquired on on the basis of the same distribution of type of holdings as now exists). If the current net acquistion rate is 25,000 volumes per year, this capacity will be exhausted in less than 8 years.

b. Method B - Comparison of existing volume equivalent capacity with required stack capacity based on a holding allowance of 0.10 ASF/Volume Equivalent.

Existing Volume Equivalent Capacity $= \frac{\text{(Current ASF of Stack Space)}}{\text{(Assumed ASF/Volume Equivalent}}$

$= \frac{\text{(43,762 ASF)}}{\text{(0.10 ASF/Volume Equivalent)}}$

= 437,620 Volume Equivalents

Less Existing Holdings = 397,580 Volume Equivalents

Additional Volume Equivalent Capacity = 40,040 Volume Equivalents

Therefore, according to this method, there is capacity for an additional 40,040 volume equivalents in the existng stack facilities. If the current net acquisition rate is 25,000 volumes per year, this capacity would be exhuasted in less than two years.

c. Method C - Comparison of existing volume equivalent capacity with required stack capacity based on a holding allowance of 0.0833 ASF/Volume Equivalent:

Existing Volume Equivalent Capacity $= \frac{\text{(Current ASF of Stack Space)}}{\text{(Assumed ASF/Volume Equivalent)}}$

$= \frac{\text{(43,762 ASF)}}{\text{(0.0833 ASF/Volume Equivalent}}$

= 525,354 Volume Equivalents

Less Existing Holdings = 397,580 Volume Equivalents

Additional Volume Equivalent Capacity = 127,774 Volume Equivalents

Therefore, according to this method there is capacity for an additional 127,774 volume equivalents in the existing stack facilities. If the current net acquisition rate is 25,000 volumes per year, this capacity would be exhausted in just over five years.

9. As a matter of institutional policy, select work station assignable square feet allowances for each type of work station in the library, compare them with existing assignable square feet, and calculate the differences.

TABLE 2.11

LIBRARY WORK STATION ASSIGNABLE SQUARE FEET ALLOWANCES BY TYPE OF WORK STATION COMPARED WITH EXISTING ASSIGNABLE SQUARE FEET BY TYPE OF STATIONS

TYPE OF LIBRARY WORK STATION (1)	ASSUMED ALLOWANCE ASF/STATION (2)	CURRENT NUMBER OF STATIONS (3)	ASSUMED ASSIGNABLE SQUARE FEET (4)=(2)x(3)	CURRENT ASSIGNABLE SQUARE FEET (5)	DIFFERENCE (6)=(5)-(4)
1. Acquisitions	100 ASF/Station	10 Stns	1,000 ASF	994 ASF	-6 ASF
2. Administration	120	5	600	607	+7
3. Bindery Prep.	250	4	1,000	964	-36
4. Catalog	110	20	2,200	2,165	-35
5. Circulation	120	12	1,440	1,440	---
6. Conference Room	20	20	400	414	+14
7. Documents	120	5	600	600	---
8. Interlibrary Loan	100	3	300	286	-14
9. Marking and Mending	100	2	200	180	-20
0. Periodicals	120	5	600	625	+25
1. Photocopy	100	2	200	220	+20
2. Receiving, Mail	300	4	1,200	1,152	-48
3. Reference	120	6	720	722	+2
4. Reserve Book	100	6	600	590	-10
5. Serials	120	6	720	720	---
6. Special Collection	120	2	240	208	-32
7. Staff Room	25	18	450	396	-54
TAL	---	130 Stations	12,470 ASF	12,283 ASF	-187 ASF

10. Evaluate the adequacy of existing library service facilities.

In view of the calculations made in the previous step, it appears that assignable square feet allowances for the current work stations in the library are acceptable. However, a question remains concerning the total amount of library service facilities in contrast to the total amount of stack and study space remains. Typically, the acceptable range of this percentage varies from 20% to 25% depending upon the size of the library.

Current Assignable Square Feet of Stack and Study Space = 72,890 ASF

Current Assignable Square Feet of Service Space = 12,283 ASF

$$\text{Percentage} = \frac{(\text{ASF of Service Space})}{(\text{ASF of Stack and Study Space})} \times (100\%)$$

$$= \frac{(12{,}283)}{(72{,}890)} \times (100\%)$$

$$= 16.9\%$$

According to this calculation it appears that, although current space is sufficient for current stations, there is not enough service space in the existing library facilities. The service requirements of the library most likely are not being met because they are understaffed. If 20% were used as an acceptable figure, there would need to be an additional 2,295 ASF in the library in order to meet the existing service requirements. This would provide enough space for the additional personnel required.

DISCUSSION

DETAILED METHOD

PROJECTION OF LIBRARY AND OTHER STUDY FACILITIES FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

- Projected number of assignable square feet of Reader Facilities (Study Rooms) required
- Projected number of reader stations in Reader Facilities by type of station,
- Projected number of library volume equivalents to be stored
- Projected number of assignable square feet of Storage (Stack) Facilities required
- Projected number of assignable square feet of Library Service (Processing) Facilities required
- Projected number of professional and clerical library staff required
- Projected number of work stations in Library Service (Processing) Facilities by type of station

PROGRAM DATA REQUIRED:

- Projected number of undergraduate students, headcount and FTE, by level of student
- Projected number of graduate students, headcount and FTE, by level of student
- Projected number of FTE faculty
- Projected number of undergraduate degree fields
- Projected number of masters degree fields in which no doctorate will be offered
- Projected number of masters degree fields in which doctorate will be offered
- Projected number of doctoral fields

FACILITIES DATA REQUIRED:

None

UTILIZATION ASSUMPTIONS REQUIRED:

For Reader Facilities:

- Percentage of student enrollment, by level, to be provided with library or other study facility reader stations
- Percentage of FTE faculty to be provided library or other study facility reader stations
- Type of reader stations to be provided each group of users

For Stack Facilities:

- Density of volume equivalents per assignable square foot

For Processing Facilities:

- Number of staff to be provided offices or work stations;
- Percentage of combined reader and stack assignable floor area to be added for Library Service (Processing) Facilities
- Number of assignable square feet per office or per work station by type of office or work station for Library Service (Processing) Facilities

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0), for the planning target year, the:
    - Projected number of undergraduate students, headcount and FTE, by level of student
    - Projected number of graduate students, headcount and FTE, by level of student
    - Projected number of FTE faculty
    - Projected number of undergraduate degree fields
    - Projected number of masters degree fields in which no doctorate will be offered
    - Projected number of masters degree fields in which a doctorate will be offered

- Projected number of doctoral degree fields

2. Compute the projected volume equivalents (units of library resources) to be accommodated in stack space for the planning target year.

   a. For four-year colleges and universities:

Basic or opening day collection	85,000 units
Per FTE student, add	15 units
Per FTE faculty, add	100 units
Per Masters degree field in which no doctorate will be offered, add	6,100 units
Per Masters degree field in which a doctorate will be offered, add	3,050 units
Per Doctoral degree field, add	24,500 units

   b. For two-year community colleges (using the Clapp-Jordan formula):

Basic or opening day collection	16,875 units
Per FTE student (day and evening), add	5 units
Per FTE faculty, add	51 units
Per academic specialty to be offered, add	165 units

3. Compute the assignable square feet of storage (stack) facilities required to house the projected number of volume equivalents or library resource units:

   Assignable Square Feet of Storage (Stack) Facilities = (Projected number of volume equivalents) x (Density of stack storage)

   The density of stack storage, expressed as assignable square feet per volume, may vary with the type of storage. Open stack-reading room storage tends to be lower density (0.15 to 0.10 ASF/volume equivalent or 8 to 10 volumes/ASF); concentrated open stacks are medium density (0.10 to 0.0833 ASF/volume equivalent or 10 to 12 volumes per ASF); closed stacks may range from 0.0833 to 0.067 ASF/volume equivalent or 12 to 15 volumes/ASF;

compact closed storage may range as high as 0.05 to 0.04 ASF/volume or 20 to 25 volumes/ASF. For projection purposes, the open stack value is usually used, 0.0833 or 0.10 ASF/volume equivalent.

4. Determine the proportions of projected users, by type of user, to be provided library reader stations or other study facility stations.

   The most common allowance is 25 per cent of the total projected student enrollment (headcount or FTE). Community colleges with a heavy emphasis on technical-trade programs (e.g., 10 percent of student credit-hours or weekly student-hours) may go down to 15 percent of the FTE enrollment. More detailed planning of library and study facilities calls for a more detailed breakdown of users (lower division, upper division, beginning graduate, advanced graduate, faculty) and a differentiation of library use among disciplines (humanities, social sciences, and professions as heavier users versus the sciences, engineering, and vocational-technical users). For the initial planning of a new institution however, this type of detail is difficult to predict, and the more general reader station factor is appropriate. Differentiation of types of reader stations is most appropriate at the facility design stage.

5. Compute the assignable square feet of reader and other study facilities required to accommodate the projected user demand.

   The assignable square feet per reader station will vary by the type of reader station if differentiation is made between multi-station tables, open carrels, enclosed carrels, audio-visual carrels, microform readers, lounge furniture, and faculty stations. This decision is most appropriately made at the design stage. However, the overall average assignable square feet per reader station will be higher than the typical average of 25 assignable square feet per reader station if a high proportion of the study station types is expected to be of the individual carrel type.

6. Estimate the projected library staffing requirements for the planning target year.

   It is recommended that library processing and service staff be estimated for the planning target size of the library as the basis for computing library processing and service space requirements. For a detailed study and projection, the should be distributed, by professiona and clerical categories, to the various library processing and service functions, e.g., acquisitions, cataloging, circulation, and so forth. If this detail cannot be developed, the total library staff may be estimated for use with an average value fo assignable square feet per work station.

7. Determine the criteria of assignable square feet per staff work station to be applied and compute the assignable square feet of library processing and service space required.

Section of this manual contains illustrative unit floor area criteria for library staff work stations by library function. These may be averaged more broadly if the functional breakdown of staffing is not attempted.

Total assignable square feet of library processing and service space required = (Projected library staff by function) x (Unit floor area criteria per work station)

If library facilities are to contain additional types of functions not adequately covered in the foregoing calculations, these functions should be identified and added to the computed space. It is suggested that when the processing and service space is computed by numbers of staff and staff work station areas as above, a test of the calculations should be made against the total projected storage and reader areas: the assignable square feet of library processing and service space should fall within the range of 20 to 25 percent of the combined assignable square feet stack storage and assignable square feet of reader space.

EXAMPLE
DETAILED METHOD
PROJECTION OF LIBRARY AND OTHER STUDY FACILITIES FOR A NEW INSTITUTION

DATA TO BE DETERMINED:

- Projected number of assignable square feet of Reader Facilities (Study Rooms) required
- Projected number of reader stations in Reader Facilities by type of station
- Projected number of library volume equivalents to be stored
- Projected number of assignable square feet of Storage (Stack) Facilities required
- Projected number of assignable square feet of Library Service (Processing) Facilities required
- Projected number of professional and clerical library staff required
- Projected number of work stations in Library Service (Processing) Facilities, by type of station.

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0), for the planning target year, the:
    - Projected number of undergraduate students, headcount and FTE, by level of student
    - Projected number of graduate students, headcount and FTE, by level of student
    - Projected number of FTE faculty
    - Projected number of undergraduate degree fields
    - Projected number of masters degree fields in which no doctorate will be offered
    - Projected number of masters degree fields in which a doctorate will be offered
    - Projected number of doctoral degree fields

TABLE 2.12

PROJECTED NUMBER OF STUDENTS, FACULTY, AND DEGREE FIELDS TO BE OFFERED FOR THE PLANNING TARGET YEAR

CATEGORY				NUMBER
STUDENTS	UNDERGRADUATE	LOWER DIVISION	HEADCOUNT	2,400
			FTE	2,200
		UPPER DIVISION	HEADCOUNT	1,920
			FTE	1,800
	GRADUATE	MASTERS	HEADCOUNT	1,400
			FTE	1,000
		DOCTORAL	HEADCOUNT	500
			FTE	500
TOTALS			HEADCOUNT	6,220
			FTE	5,500
FACULTY	UNDERGRADUATE			270
	GRADUATE			130
TOTAL				400
DEGREE FIELDS				
	UNDERGRADUATE			50
	MASTERS IN WHICH NO DOCTORATE WILL BE OFFERED			10
	MASTERS IN WHICH A DOCTORATE WILL BE OFFERED			10
	DOCTORAL			13

2. Compute the projected volume equivalents (units of library resources) to be accommodated in stack space for the planning target year.

   a. For four-year colleges and universities (using the State of Washington Method):

TABLE 2.13

REQUIRED VOLUME EQUIVALENTS FOR A UNIVERSITY
STATE OF WASHINGTON FORMULA

CATEGORY (1)	NUMBER (2)	VOLUME EQUIVALENTS PER CATEGORY (3)	TOTAL VOLUME EQUIVALENTS (4) = (2) x (3)
1. Basic or Opening Day Collection	---	---	85,000 Volume Equivalents
2. FTE Students	5,500	15 units per FTE Student	82,500
3. FTE Faculty	400	100 units per FTE Faculty	40,000
4. Masters Degree Field in which no Doctorate will be offered	10	6,100 per Degree Field	61,000
5. Masters Degree Field in which a Doctorate will be offered	10	3,050 per Degree Field	30,500
6. Doctoral Field	13	24,500 per Degree Field	318,500
TOTAL	---	---	617,500 Volume Equivalents

b. For two-year community colleges (using the Clapp-Jordan formula):

TABLE 2.14
REQUIRED VOLUME EQUIVALENTS OF LIBRARY HOLDINGS
FOR A TWO-YEAR COMMUNITY COLLEGE
THE CLAPP JORDAN FORMULA

CATEGORY (1)	NUMBER* (2)	VOLUME EQUIVALENTS PER CATEGORY (3)	TOTAL VOLUME EQUIVALENTS (4)=(2)x(3)
Basic or Opening Day Collection	---	---	16,875
FTE Students (Day and Evening)	5,500	5 per FTE Student	27,500
FTE Faculty	300	51 per FTE Faculty	15,300
Academic Specialty	50	165 per Academic Specialty	8,250
Total	---	---	67,925 Volume Equivalents

*The numbers used for this illustration conform generally to those used for the university example.

3. Compute the assignable square feet of storage stack space required to house the projected number of volume equivalents or library resource units.

Assignable Square Feet of Stack Storage = (Projected Number of Volume Equivalents) x (Density of stack storage)

= (617,500 volume equivalents) x (0.0833 ASF/volume equivalent)

= 51,458 assignable square feet

4. Determine the proportions of projected users, by type of user, to be provided library reader stations or other study facility stations.

TABLE 2.15

PROPORTIONS AND NUMBERS OF USERS, BY TYPE OF USER, TO BE PROVIDED LIBRARY READER STATIONS

TYPE OF USERS (1)	TOTAL NUMBER (2)	PROPORTION (3)	NUMBER OF USERS (4) = (2) x (3)
Lower Division FTE Students	2,200 FTE	27%	594
Upper Division FTE Students	1,800 FTE	24%	432
Masters Level FTE Students	1,000 FTE	23%	230
Doctoral Level FTE Students	580 FTE	25%	125
Faculty	400 FTE	20%	80
TOTAL	5,900 FTE	---	1,461 Users

5. Compute the assignable square feet of reader and other study facilities required to accommodate the projected user demand.

TABLE 2.16

ASSIGNABLE SQUARE FEET OF READER FACILITIES REQUIRED TO ACCOMMODATE THE PROJECTED USER DEMAND

TYPE OF USER (1)	NUMBER OF USERS (2)	TYPE OF READER STATION (3)	ASSIGNABLE SQUARE FEET PER READER STATION (4)	ASSIGNABLE SQUARE FEET (5) = (2) x (4)
1. Lower Division FTE Students	594	Tables	28 ASF/Station	16,643 ASF
2. Upper Division FTE Students	432	Tables	28 ASF/Station	12,096 ASF
3. Masters Level FTE Students	230	Open Carrels	45 ASF/Station	10,350 ASF
4. Doctoral Level FTE Students	75 50	Open Carrels Enclosed Carrels	45 ASF/Station 75 ASF/Station	3,375 ASF 3,750 ASF
5. FTE Faculty	80	Enclosed Carrels	75 ASF/Station	6,000 ASF
SUBTOTAL	1,461	----------------	--------------	52,203 ASF
6. Other*	50	Audio Visual Stations	25 ASF/Station	1,250 ASF
TOTAL	1,511	----------------	--------------	53,453 ASF

*This category is included to allow for microform reading station requirements.

6. Estimate the projected library staffing requirements for the planning target year.

TABLE 2.17

PROJECTED LIBRARY STAFFING REQUIREMENTS FOR THE PLANNING TARGET YEAR

LIBRARY UNIT	NUMBER OF PERSONS	NUMBER OF PERSONS REQUIRING WORK STATIONS
1. Acquisitions	14	12
2. Administration	8	8
3. Bindery Preparation	8	8
4. Catalog	25	20
5. Circulation	22	18
6. Conference Room	--	20*
7. Data Processing	8	6
8. Documents	8	8
9. Gifts	1	1
10. Interlibrary Loan	6	6
11. Marking & Mending	6	6
12. Periodicals	10	8
13. Photocopy	6	4
14. Receiving & Mail	8	6
15. Reference	10	6
16. Reserve Book	11	8
17. Serials	11	8
18. Special Collections	6	6
19. Special Records	4	4
20. Staff Room	--	35*
TOTALS	172	143

*Not included in the work station total.

7. Determine the criteria of assignable square feet per staff work station to be applied and compute the assignable square feet of library processing and service space required.

TABLE 2.18

ASSIGNABLE SQUARE FEET OF LIBRARY PROCESSING AND SERVICE SPACE REQUIRED

LIBRARY UNIT (1)	NUMBER OF PERSONS REQUIRING WORK STATIONS (2)	ASSIGNABLE SQUARE FEET PER WORK STATION (3)	REQUIRED ASSIGNABLE SQUARE FEET (4) = (2) x (3)
1. Acquisitions	12	100	1,200 ASF
2. Administration	8	120	960
3. Bindery Preparation	8	250	2,000
4. Catalog	20	110	2,200
5. Circulation	18	120	2,160
6. Conference Room	20*	20	400
7. Data Processing	6	120	720
8. Documents	8	120	960
9. Gifts	1	100	100
10. Interlibrary Loan	6	100	600
11. Marking and Mending	6	100	600
12. Periodicals	8	120	960
13. Photocopy	4	100	400
14. Receiving and Mail	6	300	1,800
15. Reference	6	120	720
16. Reserve Book	8	100	800
17. Serials	8	120	960
18. Special Collection	6	120	720
19. Special Records	4	120	480
20. Staff Room	35*	25	875
21. Public Areas	---	---	1,430
TOTALS	5,143	---	21,045 ASF

*Not included in the total but only indicate the number of stations needed.

The 21,045 assignable square feet of library processing and service space represents 20.1% of the projected reader and stack space assignable square feet. For this size library, this appears to be sufficient.

DISCUSSION

DETAILED METHOD

PROJECTION OF LIBRARY AND OTHER STUDY FACILITIES FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- Projected number of additional assignable square feet of Reader Facilities required
- Projected number of additional reader stations in Reader Facilities by type of station
- Projected number of additional library volume equivalents to be stored
- Projected number of additional assignable square feet of Storage (Stack) Facilities required
- Projected number of additional assignable square feet of Library Service (Processing) Facilities required
- Projected number of additional professional and clerical library staff required
- Projected number of additional work stations in Library Service (Processing) Facilities by type of station.

PROGRAM DATA REQUIRED:

- Projected number of undergraduate students, headcount and FTE, by level of student
- Projected number of graduate students, headcount, and FTE, by level of student
- Projected number of FTE faculty
- Projected number of undergraduate degree fields
- Projected number of masters degree fields in which no doctorate will be offered
- Projected number of masters degree fields in which doctorate will be offered
- Projected number of doctoral degree fields

FACILITIES DATA REQUIRED:

- Existing number of assignable square feet of Storage (Stack) facilities
- Existing number of stations in Reader Facilities by type of station
- Existing number of assignable square feet in Reader Facilities
- Existing number of assignable square feet in Library Service (Processing) Facilities

ADDITIONAL DATA REQUIRED:

- Existing number of volume equivalents of Library Holdings
- Existing number of professional and clerical staff

UTILIZATION ASSUMPTIONS REQUIRED:

For Reader Facilities:

- Percentage of student enrollment, by level, to be provided with library or other study facility reader stations
- Percentage of FTE faculty to be provided library or other study facility reader stations
- Type of reader station to be provided each group of users

For Stack Facilities:

- Density of volume equivalents per assignable square foot

For Processing Facilities:

- Number of staff to be provided offices or work stations
- Percentage of combined reader and stack assignable floor area to be added for Library Service (Processing) Facilities
- Number of assignable square feet per office or per work station, by type of office or work station, for Library Service (Processing) Facilities

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0), for the planning target year, the:

   - Projected number of undergraduate students, headcount and FTE, by level of student
   - Projected number of graduate students, headcount and FTE, by level of student
   - Projected number of FTE faculty
   - Projected number of undergraduate degree fields
   - Projected number of masters degree fields in which no doctorate will be offered
   - Projected number of masters degree fields in which a doctorate will be offered.
   - Projected number of doctoral degree fields

2. Compute the projected volume equivalents (units of library resources) to be accommodated in stack space for the planning target year

   a. For four-year colleges and universities (Washington Method)

Basic or opening day collection	85,000 units
Per FTE student, add	15 units
Per FTE faculty, add	100 units
Per Masters degree field in which no doctorate will be offered, add	6,100 units
Per Masters degree field in which a doctorate will be offered, add	3,050 units
Per Doctoral degree field, add	24,500 units

   b. For two-year community colleges (using the Clapp-Jordan formula):

Basic or opening day collection	16,875 units
Per FTE student (day and evening), add	5 units
Per FTE faculty, add	51 units
Per academic specialty to be offered, add	165 units

3. Compute the projected number of additional library volume equivalents to be stored.

   The projected number of additional library volume equivalents is the result of subtracting the existing number of volume equivalents from the projected number required.

4. Compute the assignable square feet of storage (stack) space required to house the projected number of volume equivalents or library resource units:

   Assignable Square Feet of Storage (Stack) Facilities = (Projected Number of Volume equivalents) x (Density of Stack Storage)

   The density of stack storage, expressed as assignable square feet per volume, may vary with the type of storage. Open stack-reading room storage tends to be low density (0.15 to 0.10 ASF/Volume equivalent or 8 to 10 volumes/ASF); concentrated open stacks are medium density (0.10 to 0.0833 ASF/Volume Equivalent or 10 to 12 Volumes/ASF); closed stacks may range from 0.0833 to 0.067 ASF/Volume equivalent or 12 to 15 Volumes/ASF; compact closed storage may range as high as 0.05 to 0.04 ASF/Volume or 20 to 25 Volumes/ASF. For projection purposes, the open stack value is usually used, 0.0833 or 0.10 ASF/Volume equivalent.

5. Compute the projected number of additional assignable square feet of storage (stack) facilities required.

   The projected number of additional assignable square feet of storage (stack) facilities required is the result of subtracting the existing number of assignable square feet of storage (stack) facilities from the projected number of assignable square feet required.

6. Determine the proportions of projected users, by type of user, to be provided library reader stations or other study facility stations.

   The most common allowance is 25 per cent of the total projected student enrollment (headcount or FTE). Community colleges with a heavy emphasis on technical-trade programs (e.g., 10 percent of student credit-hours or weekly student-hours) may go down to 15 percent of the FTE enrollment. More detailed planning of library and study facilities calls for a more specific breakdown of users (lower division, upper division, beginning graduate, advanced graduate, faculty) and a differentiation of library use among disciplines (humanities, social sciences, and professions as heavier users versus the sciences, engineering, and vocational-technical users). For initial planning, however, this type of detail is difficult to predict, and the more general reader station factor is appropriate. Differentiation of types of reader stations is most appropriate at the facility design stage.

7. Compute the assignable square feet of reader and other study facilities required to accommodate the projected user demand.

The assignable square feet per reader station will vary by the type of reader station if differentiation is made between multi-station tables, open carrels, enclosed carrels, audio-visual carrels, microform readers, lounge furniture, and faculty stations. This decision is made most appropriately at the design stage. However, the overall average of 25 ASF/reader station will be low if a high proportion of study station types is expected to be of the individual carrel type.

8. Calculate the projected number of additional assignable square feet of reader facilities required and the projected number of additional reader stations in reader facilities by type of station.

   As was the case in previous steps in this PROCEDURE, the result required is obtained simply by subtracting existing stations and assignable square feet from projected stations and assignable square feet.

9. Estimate the projected library staffing requirements for the planning target year.

   It is recommended that library processing and service staff be estimated for the planning target size of the library as the basis for computing library processing and service space requirements. For a detailed study and projection, the staff must be distributed by professional and clerical categories, to the various library processing and service functions, e.g., acquisitions, cataloging, circulation, and so forth. If this detail cannot be developed, the total library staff may be estimated for use with an average value for assignable square feet per work station.

10. Calculate the projected number of additional professional and clerical library staff required.

    Subtract the existing number of staff from the projected numbers of staff to determine the additional number of staff required.

11. Determine the criteria of assignable square feet per staff work station to be applied and compute the assignable square feet of library processing and service space required.

    Section 2.3 of this manual contains illustrative unit floor area criteria for library staff work stations by library functions. These may be averaged more broadly if the functional breakdown of staffing is not attempted.

Total assignable square feet of library processing and service space required	=	(Projected library staff by function) x (Unit floor area criteria per work station)

If library facilities are to contain additional types of functions not adequately covered in the foregoing calculations, these functions should be identified and added to the computed space. It is suggested that when the processing and service space is computed by numbers of staff and staff work stations as above, a test of the calculations should be made against the total projected storage and reader areas: the assignable square feet of library processing and service space should fall within the range of 20 to 25 percent of the combined assignable square feet of stack storage space and assignable square feet of reader space.

12. Calculate the projected number of additional assignable square feet of Library Service (Processing) Facilities required.

Subtract the existing assignable square feet of service facilities from the projected assignable square feet to determine the additional assignable square feet of library service (processing) facilities required.

EXAMPLE

DETAILED METHOD

PROJECTION OF LIBARY AND OTHER STUDY FACILITIES FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- Projected number of additional assignable square feet of Reader Facilities required
- Projected number of additional reader stations in Reader Facilities by type of station
- Projected number of additional library volume equivalents to be stored.
- Projected number of additional assignable square feet of Storage (Stack) Facilities required
- Projected number of additional assignable square feet of Library Service (Processing) Facilities required
- Projected number of additional professional and clerical library staff required
- Projected number of additional work stations in Library Service (Processing) Facilities by type of station

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0); for the planning target year, the:
   - Projected number of undergraduate students headcount and FTE, by level of student
   - Projected number of graduate students, headcount and FTE, by level of student
   - Projected number of FTE faculty
   - Projected number of undergraduate degree fields
   - Projected number of masters degree fields in which no doctorate will be offered

- Projected number of masters degree fields in which a doctorate will be offered
- Projected number of doctoral degree fields

TABLE 2.19

PROJECTED NUMBERS OF STUDENTS, FACULTY AND DEGREE FIELDS TO BE OFFERED FOR THE PLANNING TARGET YEAR

	CATEGORY				NUMBER
1.	STUDENTS	- UNDERGRADUATE	- LOWER DIVISION	- HEADCOUNT	2,400
			-	- FTE	2,200
			- UPPER DIVISION	- HEADCOUNT	1,920
			-	- FTE	1,800
		- GRADUATE	- MASTERS	- HEADCOUNT	1,400
			-	- FTE	1,000
			- DOCTORAL	- HEADCOUNT	500
			-	- FTE	500
	TOTALS			- HEADCOUNT	6,220
				- FTE	5,500
2.	FACULTY	- UNDERGRADUATE -			270
		- GRADUATE			130
	TOTAL				400
3.	DEGREE FIELDS				
		- UNDERGRADUATE			50
		- MASTERS IN WHICH NO DOCTORATE WILL BE OFFERED			10
		- MASTERS IN WHICH A DOCTORATE WILL BE OFFERED			10
		- DOCTORAL			13

2. Compute the projected volume equivalents (units of library resources) to be accommodated in stack space for the planning target year.

   a. For four-year colleges and universities:

TABLE 2.20

REQUIRED VOLUME EQUIVALENTS FOR A UNIVERSITY

CATEGORY (1)	NUMBER (2)	VOLUME EQUIVALENTS PER CATEGORY (3)	TOTAL VOLUME EQUIVALENTS (4) = (2) x (3)
1. Basic or Opening Day Collection	---	---	85,000
2. FTE Students	5,500	15 units per FTE Student	82,500
3. FTE Faculty	400	100 units per FTE Faculty	40,000
4. Masters Degree Field in which no Doctorate will be offered	10	6,100 per Degree Field	61,000
5. Masters Degree Field in which Doctorate will be offered	10	3,050 per Degree Field	30,500
6. Doctoral Field	13	24,500 per Degree Field	318,500
TOTAL	---	---	617,500 Volume Equivalents

b. For two-year community colleges (using the Clapp-Jordan formula):

TABLE 2.21

REQUIRED VOLUME EQUIVALENTS OF LIBRARY HOLDINGS FOR A TWO-YEAR COMMUNITY COLLEGE

CATEGORY (1)	NUMBER* (2)	VOLUME EQUIVALENTS PER CATEGORY (3)	TOTAL VOLUME EQUIVALENTS (4)=(2)x(3)
1. Basic or Opening Day Collection	---	---	16,8755
2. FTE Students (Day and Evening)	5,500	5 per FTE Student	27,500
3. FTE Faculty	300	51 per FTE Faculty	15,300
4. Academic Specialty	50	165 per Academic Specialty	8,250
TOTAL	---	---	67, 925 Volume Equivalent

*The numbers used for this illustration conform generally to those used for the university example.

3. Compute the projected number of additional library volume equivalents to be stored.

Calculated Volume Equivalent required for Planning Target Year = 617,500 Volume Equivalents

Existing Volume Equivalents of Library Holdings = 397,580 Volume Equivalents

Additional Library Volume Equivalents to be stored = 219,920 Volume Equivalents

4. Compute the assignable square feet of stack storage space required to house the projected number of volume equivalents or library resource units.

Assignable Square Feet of Stack Storage = (Projected Number of Volume Equivalents) x (Density of Stack Storage)

Assignable Square Feet of Stack Storage = (617,500 Volume Equivalents) x (.0833 ASF/Volume Equivalent)

Assignable Square Feet of Stack Storage = 51,458 Assignable Square Feet

5. Compute the projected number of additional assignable square feet of storage (stack) facilities required.

Assignable Square Feet of Storage (Stack) Facilities to hold projected number of Volume Equivalents = 51,458 ASF

Existing Assignable Square Feet of Storage (Stack) Facilities = 43,762 ASF

Projected number of additional Assignable Square Feet of Storage (Stack) Facilities required = 7,696 ASF

6. Determine the proportions of projected users, by type of user, to be provided library reader stations or other study facility stations.

TABLE 2.22

PROPORTIONS AND NUMBERS OF USERS, BY TYPE OF USER, TO BE PROVIDED LIBRARY READER STATIONS

TYPE OF USERS (1)	TOTAL NUMBER (2)	PROPORTION (3)	NUMBER OF USERS (4) = (2) x (3)
1. Lower Division FTE Students	2,200 FTE	27%	594
2. Upper Division FTE Students	1,800 FTE	24%	432
3. Masters Level FTE Students	1,000 FTE	23%	230
4. Doctoral Level FTE Students	580 FTE	25%	125
5. Faculty	400 FTE	20%	80
TOTAL	5,900 FTE	---	1,461 Users

7. Compute the assignable square feet of reader and other study facilities required to accommodate the projected user demand.

TABLE 2.23

ASSIGNABLE SQUARE FEET OF READER FACILITIES REQUIRED TO ACCOMMODATE THE PROJECTED USER DEMAND

TYPE OF USER (1)	NUMBER OF USERS (2)	TYPE OF READER STATION (3)	ASSIGNABLE SQUARE FEET PER READER STATION (4)	ASSIGNABLE SQUARE FEET (5) = (2) x (4)
1. Lower Division FTE Students	594	Tables	28 ASF/Station	16,643 ASF
2. Upper Division FTE Students	432	Tables	28 ASF/Station	12,096 ASF
3. Masters Level FTE Students	230	Open Carrels	45 ASF/Station	10,350 ASF
4. Doctoral Level FTE Students	75 50	Open Carrels Enclosed Carrels	45 ASF/Station 75 ASF/Station	3,375 ASF 3,750 ASF
5. FTE Faculty	80	Enclosed Carrels	75 ASF/Station	6,000 ASF
SUBTOTAL	1,461	---	---	52 203 ASF
6. Other*	50	Audio-Visual Stations	25 ASF/Station	1,250 ASF
TOTAL	1,511	---	---	53,453 ASF

*This category is included to allow for microform reading station requirements.

8. Calculate the projected number of additional assignable square feet of reader facilities required and the projected number of additional reader stations in reader facilities, by type of station.

TABLE 2.24

ADDITIONAL STATIONS BY TYPE OF STATION AND ASSIGNABLE SQUARE FEET REQUIRED IN READER FACILITIES IN THE PLANNING TARGET YEAR

TYPE OF USER (1)	NUMBER (2)	EXISTING STATIONS (3)	ADDITIONAL STATIONS REQUIRED (4)=(3)=(2)	PROJECTED ASSIGNABLE SQUARE FEET (5)	EXISTING ASSIGNABLE SQUARE FEET (6)	ADDITIONAL ASSIGNABLE SQUARE FEET (7)=(5)-(6)
1. Lower Division FTE Students	594	480	114 Stations	16,632 ASF	12,140 ASF	4,492 ASF
2. Upper Division FTE Students	432	---	432	12,096	---	12,096
3. Masters Level FTE Students	230	230	---	10,350	10,350	---
4. Doctoral Level FTE Students	75	50	25	3,375	2,256	1,119
	50	---	50	3,750	---	3,750
5. FTE Faculty	80	60	20	6,000	3,617	2,383
SUBTOTAL	1,461	820	641	52,203 ASF	28,363 ASF	23,840 ASF
6. Other*	50	30	20	1,250 ASF	765 ASF	485 ASF
TOTAL	1,511	850	661 Stations	53,453 ASF	29,128 ASF	24,325 ASF

*This category is included to allow for microform reading station requirements.

9. Estimate the projected library staffing requirements for the planning target year.

TABLE 2.25

PROJECTED LIBRARY STAFFING REQUIREMENTS
FOR THE PLANNING TARGET YEAR

LIBRARY UNIT	NUMBER OF PERSONS	NUMBER OF PERSONS REQUIRING WORK STATIONS
1. Acquisitions	14	12
2. Administration	8	8
3. Bindery Preparation	8	8
4. Catalog	25	20
5. Circulation	22	18
6. Conference Room	--	20*
7. Data Processing	8	6
8. Documents	8	8
9. Gifts	1	1
10. Inter-Library Loan	6	6
11. Marking & Mending	6	6
12. Periodicals	10	8
13. Photocopy	6	4
14. Receiving & Mail	8	6
15. Reference	10	6
16. Reserve Book	11	8
17. Serials	11	8
18. Special Collections	6	6
19. Special Records	4	4
20. Staff Room	--	35*
TOTALS	172	143

*Not included in the work station total.

10. Calculate the projected number of additional professional and clerical library staff required

TABLE 2.26

PROJECTED NUMBER OF ADDITIONAL PROFESSIONAL AND CLERICAL LIBRARY STAFF REQUIRED WHO REQUIRE WORK STATIONS

LIBRARY UNIT (1)	PROJECTED NUMBER OF PERSONS REQUIRING STATIONS (2)	EXISTING NUMBER OF PERSONS REQUIRING STATIONS (3)	ADDITIONAL NUMBER REQUIRED (4) = (2) - (3)
1. Acquisitions	12	10	2
2. Administration	8	5	3
3. Bindery Preparation	8	4	4
4. Catalog	20	20	--
5. Circulation	18	12	6
6. Data Processing	6	--	6
7. Documents	8	5	3
8. Gifts	1	--	1
9. Inter-Library Loan	6	3	3
10. Marking and Mending	6	2	4
11. Periodicals	8	5	3
12. Photocopy	4	2	2
13. Receiving and Mail	6	4	2
14. Reference	6	6	--
15. Reserve Book	8	6	2
16. Serials	8	6	2
17. Special Collections	6	2	4
18. Special Records	4	--	4
TOTALS	143	92	51

11. Determine the criteria of assignable square feet per staff work station to be applied and compute the assignable square feet of library processing and service space required.

TABLE 2.27

ASSIGNABLE SQUARE FEET OF LIBRARY PROCESSING AND SERVICE SPACE REQUIRED

LIBRARY UNIT (1)	NUMBER OF PERSONS REQUIRING WORK STATIONS (2)	ASSIGNABLE SQUARE FEET PER WORK STATION (3)	REQUIRED ASSIGNABLE SQUARE FEET (4) = (2) x (3)
1. Acquisitions	12	100	1,200 ASF
2. Administration	8	120	960
3. Bindery Preparation	8	250	2,000
4. Catalog	20	110	2,200
5. Circulation	18	120	2,160
6. Conference Room	20*	20	400
7. Data Processing	6	120	720
8. Documents	8	120	960
9. Gifts	1	100	100
10. Inter-Library Loan	6	100	600
11. Marking and Mending	6	100	600
12. Periodicals	8	120	960
13. Photocopy	4	100	400
14. Receiving and Mail	6	300	1,800
15. Reference	6	120	720
16. Reserve Book	8	100	800
17. Serials	8	120	960
18. Special Collection	6	120	720
19. Special Records	4	120	480
20. Staff Room	35*	25	875
21. Public Areas	---	---	1,430
TOTALS	5,143	---	21,045 ASF

*Not included in the total but only indicates the number of stations needed.

12. Calculate the projected number of additional assignable square feet of Library Service (Processing) Facilities required

TABLE 2.28

LIBRARY UNIT (1)	PROJECTED ASSIGNABLE SQUARE FEET (2)	EXISTING ASSIGNABLE SQUARE FEET (3)	ADDITIONAL ASSIGNABLE SQUARE FEET (4) = (2) - (3)
1. Acquisitions	1,200 ASF	994 ASF	206 ASF
2. Administration	960	607	353
3. Bindery Preparation	2,000	964	1,036
4. Catalog	2,200	2,165	35
5. Circulation	2,160	1,440	720
6. Conference Room	400	414	(-14)
7. Data Processing	720	-----	720
8. Documents	960	600	360
9. Gifts	100	-----	100
10. Inter-Library Loan	600	286	314
11. Marking and Mending	600	180	420
12. Periodicals	960	625	335
13. Photocopy	400	220	180
14. Receiving and Mail	1,800	1,152	648
15. Reference	720	722	(-2)
16. Reserve Book	800	590	210
17. Serials	960	720	240
18. Special Collections	720	208	512
19. Special Records	480	-----	480
20. Staff Room	875	396	479
21. Public Records	1,430	-----	1,430
TOTALS	21,045 ASF	12,283 ASF	8,762 ASF

DISCUSSION

GENERAL PLANNING METHOD

EVALUATION OF EXISTING LIBRARY AND OTHER STUDY FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Capacity of existing library stack storage in volume equivalents
- Capacity of existing reader and other study facilities
- Ratio of library processing and service facilities to total library stack and reader floor area

PROGRAM DATA REQUIRED:

- Headcount and FTE student enrollments to be serviced by library and other study facilities

FACILITIES DATA REQUIRED:

- Existing assignable square feet of floor area in room type Stack
- Proportion of the area in room type Open-Stack Reading Room allocated to stack use
- Existing assignable square feet of floor area and numbers of stations in room type Study (Reader) facilities
- Proportion of the area in room type Open-Stack Reading Room allocated to reader stations
- Existing assignable square feet of floor area in room types Library Processing Rooms and Study Facilities Service

UTILIZATION ASSUMPTIONS REQUIRED:

- Stack storage density criterion in assignable square feet per volume equivalent
- Percentage of the student FTE population to be provided with library reader stations or other study facility stations
- Average assignable square feet per station for library reader stations and other study facilities stations
- Library processing and service floor area as a percentage of the total floor area assigned to library reader and stack facilities

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0) the number of headcount and FTE student enrollments to be serviced by library and other study facilities.

2. Obtain from the facilities inventory the number of assignable square feet and stations in existing library and other study facilities by type of space.

3. Establish as a matter of institutional policy the:

   - Stack storage density criterion in assignable square feet per volume equivalent

   - Percentage of the student FTE population to be provided with library reader stations or other study facility stations

   - Average assignable square feet per station for library reader stations and other study facilities stations

4. Obtain the number of current library holdings in volume equivalents.

5. Determine the estimated stack storage capacity in volume equivalents.

   The mathematical quotient of dividing the assignable floor area assigned to stack storage by the stack storage density criterion, or

$$\text{Estimated Stack Storage Capacity} = \frac{\text{(Stack Storage Assignable Square Feet)}}{\text{(Stack Storage Density Criterion)}}$$

6. Calculate the excess capacity in the current library stack storage capacity.

   Subtract the existing number of library volume equivalents from the estimated stack storage capacity determined in Step 1.

7. Determine the number of years before library holdings will reach existing capacity.

   Divide the excess in the current stack storage capacity by the current net acquisition rate per year.

8. Determine the percentage of FTE students which currently are provided with reader and other study stations.

$$\text{Percentage of FTE Student Population Currently Provided With Stations} = \frac{\text{(Current Reader Stations)}}{\text{(Total FTE Student Enrollment)}} \times (100\%)$$

9. Evaluate the actual number of reader stations.

   Divide the assignable square feet in reader and other study stations by the expected average assignable square feet per reader station and compare this result with the actual number of reader and study stations.

10. Determine the percentage which existing Library Service Area is of the combined areas of stack and reader areas.

    Divide the total assignable square feet of library processing and service floor area by the total combined assignable square feet of library stack storage and reader area.

COMMENT ON THE PROCEDURE:

The foregoing GENERAL PLANNING METHOD for the evaluation of existing library and other study facilities provides a gross indication of current library capacity. It is recommended that this analysis always be accompanied by the projection of library requirements for up to ten years, so that the analysis of current facilities is put in the perspective of expected future growth. Whether or not nonlibrary study facilities are counted as part of the reader station capacity, along with library reader facilities, is a matter of institutional policy.

Note: It is assumed that space for faculty library stations is included in the total reader facilities. The institution may wish to evaluate faculty study space as a separate element.

EXAMPLE

GENERAL PLANNING METHOD

EVALUATION OF EXISTING LIBRARY AND OTHER STUDY FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Capacity of existing library stack storage in volume equivalents
- Capacity of existing reader and other study facilities
- Ratio of library processing and service facilities to total library stack and reader floor area

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0) the number of headcount and FTE student enrollments to be serviced by library and other study facilities.

   Headcount Students = 4,760 Headcount

   Full-Time Equivalent Students = 4,000 FTE

2. Obtain from the facilities inventory the number of assignable square feet and stations in existing library and other study facilities by type of space.

	Stations	ASF
Stack	----	43,762 ASF
Reader Area	850	29,128 ASF
Service Area	130	12,283 ASF
Total	----	85,173 ASF

3. Establish as a matter of institutional policy the:

   - Stack storage density criterion in assignable square feet per volume equivalent
   - Percentage of the student FTE population to be provided with library reader stations or other study facility stations
   - Average assignable square feet per station for library reader stations and other study facilities stations

Stack Storage Density Criterion = $.0833\ \frac{\text{assignable square feet}}{\text{volume equivalent}}$

Percentage of Student FTE Population to be provided Stations = 20%

Average Assignable Square Feet per Reader Station = 30 ASF/Station

4. Obtain the number of current library holdings in volume equivalents.

Current Library Holdings = 397,580 volume equivalents

5. Determine the estimated stack storage capacity in volume equivalents.

$$\text{Estimated Stack Storage Capacity} = \frac{(\text{Stack Storage Assignable Square Feet})}{(\text{Stack Storage Density Criterion})}$$

$$= \frac{(\text{ASF})}{(\text{ASF/volume equivalent})}$$

$$= \frac{(43{,}762\ \text{ASF})}{(.0833\ \text{ASF/volume equivalent})}$$

$$= 525{,}414\ \text{volume equivalents}$$

6. Calculate the excess capacity in the current library stack storage capacity.

Estimated Stack Storage Capacity = 525,414 volume equivalents

Current Library Holdings = 397,580 volume equivalents

Excess Capacity = 127,834 volume equivalents

7. Determine the number of years before library holdings will reach existing capacity.

Given the current net acquisition rate of 25,000 volume equivalents per year, existing capacity will be reached in approximately 5 years.

8. Determine the percentage of FTE students which currently are provided with reader and other study stations.

$$\text{Percentage of FTE Student Populations Currently Provided with Stations} = \frac{(\text{Current Reader Stations})}{(\text{Total FTE Student Enrollment})} \times (100\%)$$

$$= \frac{(850 \text{ Stations})}{(4{,}000 \text{ FTE Students})}$$

$$= 21.2\%$$

This percentage is acceptable in comparison with the 20% which was adopted as the acceptable figure.

9. Evaluate the actual number of reader stations.

$$\text{Expected Number of Reader Stations} = \frac{(\text{Assignable Square Feet in Reader Space})}{(\text{Expected Assignable Square Feet per Station})}$$

$$= \frac{(29{,}128 \text{ ASF})}{(30 \text{ ASF/Station})}$$

$$= 971 \text{ Stations}$$

$$\text{Actual Number of Stations} = 850 \text{ Stations}$$

Therefore, more reader stations can be added to the existing Reader and other study facilities space, should the need arise.

10. Determine the percentage which existing Library Service Area is of the combined areas of stack and reader areas.

$$\text{Percentage Library Service Area} = \frac{(\text{Library Service Assignable Square Feet})}{(\text{Combined Stack and Reader Assignable Square Feet})} \times (100\%)$$

$$= \frac{(12{,}283 \text{ ASF})}{(72{,}890 \text{ ASF})} \times 100\%$$

$$= 16.7\%$$

This percentage indicates an inadequate amount of library service facilities.

DISCUSSION

GENERAL PLANNING METHOD

PROJECTION OF LIBRARY AND OTHER STUDY FACILITY REQUIREMENTS

DATA TO BE DETERMINED:

- Projected number of volume equivalents to be housed in library stack storage
- Projected number of assignable square feet of library stack storage
- Projected number of assignable square feet of library reader and other study facilities
- Projected number of assignable square feet of library processing and service facilities
- Projected number of additional assignable square feet of library and other study facilities required

PROGRAM DATA REQUIRED:

- Projected number of headcount and full-time equivalent student enrollments by level of student
- Projected number of FTE faculty

FACILITIES DATA REQUIRED:

- Number of assignable square feet of library and other study facilities to be continued in use by
  - Study rooms
  - Stacks
  - Open-Stack reading rooms
  - Library processing rooms
  - Study Facilities service
- Number of stations in library reading and other study facilities

UTILIZATION ASSUMPTIONS REQUIRED:

- Stack storage density criterion in assignable square feet per volume equivalent
- Percentage of projected student enrollment for which library reading or other study stations are to be provided
- Average assignable square feet per library reading or other study station
- Percentage of combined projected assignable square feet of library stack storage and reader station area to be added for library processing and service facilities

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0), projected headcount and full-time equivalent student enrollments by level of student and the projected number of faculty.

   These numbers will be combined into a figure known as the user population.

2. Determine the size of library holdings in volume equivalents for the planning target year.

   See the application of formulas for estimating the size of library collections in Sections 2.11 and 2.12 of this manual. Perhaps the quickest formula to use is that of the American Library Association. The enrollment projection categories of Step 1 have been designed accordingly.

3. Establish as a matter of institutional policy the stack storage density criterion in assignable square feet per volume equivalent.

4. Determine the assignable square feet of stack storage space required.

   The assignable square feet of stack storage space required is the mathematical product of the required number of volume equivalents and the stack storage density criterion.

5. Determine the additional stack storage space required.

   Subtract the existing stack storage space from the required stack storage space to determine the additional requirements.

6. Establish as a matter of institutional policy the percentage of the projected user population for which library reader or other study stations are to be provided.

7. Determine the number of reader stations to be provided.

   The number of reader stations to be provided is the product of the total projected user population and the percentage to be provided stations.

8. Determine the additional number of reader stations to be provided.

   Subtract the existing number of reader stations from the projected number of reader stations to determine the additional requirements.

9. Establish as a matter of institutional policy the average assignable square feet per reader stations.

10. Determine the number of assignable square feet of reader and other study facilities required.

    The amount of reader space is the mathematical product of the required number of stations and the assignable square feet per station.

11. Determine the number of additional assignable square feet of reader and other study facilities required.

    Subtract the existing reader space from the projected reader space to determine the additional requirements.

12. Establish as a matter of institutional policy its percentage which library service facilities will be of the combined reader and stack space.

13. Determine the number of assignable square feet of library service space required.

    The number of assignable square feet of library service space is the mathematical product of the percentage which service space is of the combined reader and stack space and the sum of the areas of the reader and stack space.

14. Determine the projected number of additional assignable square feet of library service facilities required.

    Subtract the existing service facilities space from the projected service facilities space to determine the additional requirements.

COMMENT ON THE PROCEDURE:

As an alternative of using the percentage factor for estimating library processing and service space requirements, the institution may prefer to project library staffing requirements and program office and other work area requirements directly. In this General Planning Method, it is assumed that space for faculty studies in the library are part of the overall reader facilities projection. The institution may want, however, to project faculty study space requirements as a separate element.

EXAMPLE

GENERAL PLANNING METHOD

PROJECTION OF LIBRARY AND OTHER STUDY FACILITY REQUIREMENTS

DATA TO BE DETERMINED:

- Projected number of volume equivalents to be housed in library stack storage
- Projected number of assignable square feet of library stack storage
- Projected number of assignable square feet of library reader and other study facilities
- Projected number of assignable square feet of library processing and service facilities
- Projected number of additional assignable square feet of library, and other study facilities required in the projection period

PROCEDURE:

1. Obtain from the Program Planning and Analysis Procedures (See Manual Six, Sections 2.0 and 3.0), projected headcount and full-time equivalent student enrollments by level of student, and the projected number of faculty.

	HEADCOUNT	FTE
Lower Division Students	2,400	2,200
Upper Division Students	1,920	1,800
Masters Level Students	1,400	1,000
Doctoral Level Students	500	500
Faculty	480	400
TOTALS	6,700	5,900

2. Determine the size of library holdings in volume equivalents for the planning target year.

TABLE 2.29

REQUIRED VOLUME EQUIVALENTS

TYPE OF USER (1)	NUMBER (2)	WEIGHT (3)	SERVICE LOAD UNITS (4) = (2) x (3)	VOLUMES PER SERVICE LOAD (5)	ESTIMATED VOLUMES REQUIRED (6) = (4) x (5)
FTE Lower Division	2,200	1	2,200	100	220,000
FTE Upper Division	1,800	2	3,600	50	180,000
FTE Masters Level	1,000	3	3,000	50	150,000
FTE Doctoral	500	4	2,000	75	150,000
FTE Faculty	400	5	2,000	75	150,000
TOTALS	5,900	-	------	---	850,000 volume equivalents

3. Establish as a matter of institutional policy the stack storage density criterion in assignable square feet per volume equivalent.

Stack Storage Density Criterion = (Volume Equivalent) x (Assignable Square Feet per Volume Equivalent)

4. Determine the assignable square feet of stack storage space required.

Stack Storage Space Required = .0833 assignable square feet per volume equivalent
= (850,000) x (.0833)
= 70,805 assignable square feet

5. Determine the additional stack storage space required.

Stack Storage Space Required = 70,805 ASF
Existing Stack Storage Space = 43,762 ASF

Additional Stack Storage Space Required = 27,043 ASF

6. Establish as a matter of institutional policy the percentage of the projected user population for which library reader or other study stations are to be provided.

   Percentage of User Enrollment to be Provided Reader Stations = 20%

7. Determine the number of reader stations to be provided.

   Number of Reader Stations to be Provided = (Percentage of User Population to be Provided Reader Stations) x (Projected User Population)

   = (20%) x (5,900)

   = 1,180 Stations

8. Determine the additional number of reader stations to be provided.

   Projected Stations Required = 1,180 Stations
   Existing Stations = 850 Stations

   Additional Stations Required = 350 Stations

9. Establish as a matter of institutional policy the average assignable square feet per reader station.

   Average Assignable Square Feet per Reader Station = 30 ASF/Station

10. Determine the number of assignable square feet of reader and other study facilities required.

   Reader Space Required = (Required Number of Stations) x (Assignable Square Feet per Reader Station)

   = (1,180 Stations) x (30 ASF/Station)

   = 35,400 assignable square feet

11. Determine the number of additional assignable square feet of reader and other study facilities required.

Reader Space Required = 35,400 ASF
Existing Reader Space = 29,128 ASF

Additional Reader Space Required = 5,272 ASF

12. Establish as a matter of institutional policy the percentage which library service facilities will be of combined reader and stack space.

Library Service Space = 25% of Reader and Stack Space

13. Determine the number of assignable square feet of library service space required.

Library Service Space Required = (Percentage) x (Assignable Square Feet of Combined Reader and Stack Space)

= (25%) x (106,205 ASF)

= 21,241 ASF

14. Determine the projected number of additional assignable square feet of library service facilities required.

Service Space Required = 21,241 ASF
Existing Service Space = 12,283 ASF

Additional Service Space Required = 8,958 ASF

UNIT FLOOR AREA CRITERIA

ROOM TYPE Study Facilities

ROOM TYPE CODES:

410	Study Rooms
420	Stack
430	Open-Stack Reading Room
440	Library Processing Rooms
455	Study Facilities Service

DESIGN CRITERIA TABULATED BY:

- Type of station

DISCUSSION:

TABLE 2.30 is a tabulation of work station space allowances for the various types of stations found within study facilities. Saturation type shelving assignable square feet per volume allowances are included in TABLE 2.31 (See Manual Six, Section 5.0 for Planning Criteria).

UNIT FLOOR AREA CRTIERIA:

TABLE 2.30

LIBRARY FACILITIES UNIT FLOOR AREA CRITERIA

TYPE OF WORK STATION		ASSIGNABLE SQUARE FEET/WORK STATION
	Study Station	
1.	Tables and Chairs	25 - 30
2.	Open Carrels	25 - 40
3.	Lounge Stations	40 - 60
4.	Enclosed Carrels (Faculty Studies)	50 - 80
5.	Audio-Visual Stations	35 - 50
6.	Microform Ready Station	25 - 40
	Staff Work Stations	
7.	Acquisition	90 - 110
8.	Administration	100 - 120
9.	Bindery Preparation	230 - 260
10.	Catalog	100 - 120
11.	Circulation	110 - 130
12.	Conference Room	15 - 25
13.	Data Processing	100 - 120
14.	Documents	100 - 120
15.	Gifts	100 - 110
16.	Inter-Library Loan	100 - 120
17.	Marking and Mending	100 - 120
18.	Periodical	100 - 120
19.	Photocopy	100 - 120
20.	Receiving and Mail	250 - 300
21.	Reference	110 - 130
22.	Reserve Book	100 - 110
23.	Serials	100 - 120
24.	Special Collections	100 - 120
25.	Special Records	100 - 120
26.	Staff Room	20 - 30
27.	Typing Pool	60 - 80

TABLE 2.31

SATURATION TYPE SHELVING CRITERIA*
ASSIGNABLE SQUARE FEET PER ITEM

TYPE OF LIBRARY HOLDING	ASSIGNABLE SQUARE FEET PER ITEM
Bound Volumes	8.7 ASF/125 items
Documents and Pamphlets	8.7 ASF/1000 items
Boxed Microfilm	8.7 ASF/400 reels
Boxed Microprint	8.7 ASF/10,000 cards
Unbound Newspaper Titles	8.7 ASF/7 titles
Bound Newspaper Volumes	8.7 ASF/9 items
Unbound Periodical Titles	15.0 ASF/15 items
Bound Periodical Titles	8.7 ASF/30 items
Records (Recordings)	8.7 ASF/500 items
Reference Volumes	15.0 ASF/75 items

*These criteria indicate the maximum number of items of each type of library holding which can be computed into a unit of shelving. Sections 2.12 and 2.13 of this Manual discuss the implications of different shelving densities.

AUDIO-VISUAL AND RADIO-TELEVISION FACILITIES

ROOM TYPES INCLUDED:

Audio-Visual, Radio, Television Facilities (production & distribution)

Audio-Visual, Radio, Television Facilities Service

DISCUSSION:

The use of audio-visual technology and radio and television instruction has greatly expanded in higher education in the past decade. Many experts believe that the potential of electronic media as learning aids has barely been tapped. Some envision that future developments of computer-assisted instruction, programmed learning with video and audio carrels, and the use of both closed-circuit and broadcast television will revolutionize traditional methods of instruction. Remote terminal access to computers and to audio and video tape libraries, indeed, may reduce greatly the amount of instruction conducted by the traditional lecture-discussion methods and disperse the locations of learning activity away from the central core of the traditional campus.

Although skeptical reaction to the early enthusiasm for television and other forms of audio-visual teaching has tempered the more glowing visions of automated learning, growth and development of programmed learning techniques and computer-assisted instruction will continue to have a major impact on the nature of college and university facilities in the future. Since the technology is still in a state of flux, it is extremely difficult to predict what the nature of this impact will be.

At the present, the variation among institutions in terms of the types and amounts of audio-visual facilities required and the organization of such facilities covers an enormous range.

Some institutions have developed large, centralized audio-visual service centers. These centers are staffed with professional and technical personnel engaged in the production of audio-visual instructional materials, closed-circuit and broadcast television programming, and programmed learning systems. They maintain and distribute audio-visual equipment for campus-wide, and sometimes state-wide use. Often, they are responsible for the processing, maintenance, and distribution of large film and tape libraries. These installations require large amounts of space for studio production, film and tape reproduction, graphic arts services, equipment repair and maintenance, and storage of equipment and materials. In many cases, these facilities are used for instruction and research in the communications arts and learning processes as well as for providing audio-visual services to other instruction and public service programs.

As a result of these variations, no explicit methods and criteria can be applied to the evaluation and planning of audio-visual, radio, and television facilities. Such facilities must be programmed to the scope and scale of audio-visual service and instructional operations that the individual institution decides to develop and the ways in which such operations are to be organized. Although considerable attention has been given to the design of such facilities, no satisfactory set of unit floor area criteria or general planning factors are available*

GENERAL PLANNING CONSIDERATIONS:

The general steps to be taken in programming for audio-visual and radio-television studios are as follows:

1. Program Policy is outlined:

   - Is a central audio-visual production and service facility desired?
   - Are instructional facilities (lecture halls, classrooms, small groups, language laboratories, film-making, television, and radio studios, and the like) to be included in the central facility?
   - What is the market area for audio-visual services? campus? multi-campus? state-wide? national?
   - To what extent will the audio-visual service engage in the production of instructional materials and radio-television programs?
   - How is the service to be organized?

2. Staffing Requirements are estimated:

   - What is the scope and content of services and production?
   - How many and what kinds of professional technical staff are required to operate the services and production operations?
   - What are the clerical staff support requirements?

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*The following publications of the Educational Facilities Laboratories are helpful in developing design of specialized audio-visual facilities: New Building on Campus: Six Designs for a College Communications Center (Case Study No. 7); Planning for Schools with Television: Design for ETV (Revised edition, 1968); see also University Facilities Research Center, Space for Audio-Visual Large Group Instruction (Madison, December, 1963).

3. Media storage requirements are estimated:

   - What amounts of film, tape, slide, and other materials need to be stored, maintained and retreived?

   - What amounts of equipment (projectors, recorders, etc.) must be stored during periods of low distribution and use?

4. Equipment maintenance functions are determined:

   - Will equipment be repaired and maintained by the audio-visual service or by outside contract?

5. Production functions are specified:

   - Will the audio-visual service engage in the production and reproduction of films, audio and video tapes, slides, and other materials?

   - Will graphic arts services be supplied?

   - Will studio production of films, television programs, and radio programs be part of the service?

6. Instructional functions are determined:

   - Will the audio-visual facilities be used for training in communications arts and education?

   - What are the relationships between the faculty and the audio-visual professional and technical staff to be?

These kinds of decisions must be quantified in terms of numbers of personnel, amounts of media to be stored, amounts of equipment of various types, and numbers of special facilities such as studios, workrooms, darkrooms, and graphic arts workrooms.

Office space for professional and clerical personnel can be programmed as any other type of office space (see Manual Three, Section 2.0). Technical personnel usually are housed in production and maintenance workrooms, but some may require office space.

Media storage space for films, tapes, slides, and other material can be programmed in much the same way as library stack storage (Manual Four, Section 2.0), depending on types of shelving or casing needed.

Equipment maintenance space is essentially like an electronic repair shop; the amount of space required depends on the volume of work handled and the number of technicians required.

Production space will vary with the type of studios required. Motion picture production generally requires very large spaces and substantial amount of service space for processing and editing. Television studios vary greatly in size, but they generally require large, high ceiling rooms plus large amounts of control and equipment space. Tape, film, and photographic reproduction facilities are largely determined by equipment. Graphic arts production can vary from a single drawing board to substantial floor area requirements for equipment and construction.

Instructional facilities oriented to audio-visual systems can be programmed in the same manner as classrooms, class labs, and special class labs (Section 3.5 of Manual Two). However, special consideration must be given to the design of instructional facilities equipped for audio-visual instruction, and substantial amounts of service space often are required for equipment, projection booths, and storage. If these kinds of instructional facilities are concentrated in an audio-visual center, learning center, or communications center, service facilities also can be concentrated, probably with some saving of space. If specialized audio-visual instructional facilities are dispersed in different parts of the campus, each facility must have at least a minimum amount of service and storage space in conjunction.

Because of the wide variety of forms and components that audio-visual facilities can take and because of the requirements imposed by technical considerations, there are no particular unit floor area criteria available. Such facilities must be the subject of specialized study and design to provide for the type of audio-visual production, service, and instruction conducted or planned by the institution.

MUSEUM, GALLERY, AND OTHER EXHIBITION FACILITIES

ROOM TYPES INCLUDED:

Exhibition Facilities (e.g., Museums and galleries)

Exhibition Facilities Service

DISCUSSION:

Museums, art galleries, and similar types of exhibition facilities generally are institutionally unique in size, content, and operation. These unique characteristics have created a situation in which no particular methods or planning criteria are available which can be applied to all types.

These types of exhibition facilities are intended to serve as extensions of the instructional processes, providing visual and tactile experience with natural objects (geological, botanical, and zoological specimens), artifacts of ancient and modern human culture, and works of art.

In varying degrees, college and university museums and galleries also serve the research and public service programs of the institution.

The basic functions of museums, galleries, and other exhibition facilities that determine space requirements are as follows:

The curatorial function: The selecting, preparating, preserving, cataloging, and maintaining of collections requires professional staff (often members of the faculty) supported by technical and clerical assistance varying with the size and support of the program. Workroom, shop, and office space is required.

The exhibition function: The display of items in a museum or gallery usually requires a substantial amount of floor area to insure appropriate space for display cases and circulation areas, and for proper lighting and viewing of displays (especially art collections). The selecting, scheduling, constructing, and arranging of exhibits and displays from an institution's own collection and from borrowed collections also requires the availability of professional and technical staff. As a result, this function requires office space in addition to the exhibition facilities.

The storage function: The storage of collections can be a major, but widely varying, space consumer. Some institutions house world-wide collections of specimens, artifacts, and works of art. Shipping and receiving of materials then becomes a significant space requirement. In many cases, the museum houses collections that are heavily used in class laboratory work and in art and art history courses. Types of storage facilities vary widely, from card files which preserve plant specimens in envelopes to geological core drilling samples weighing more than 100 pounds each. Valuable collections of paintings require vault-type storage for security, controlled temperature and regulated humidity. When a shortage of storage space for collections develops, the question of storing obsolete and unused collections may arise. Generally, however, museum collections are hard to dispose of and requirements for storage facilities seem to grow continuously.

The research function: Museum and art collections continue to be an important research resource in the natural sciences, anthropology and archeology, and in the fine arts. The taxonomic approach to the natural sciences, although not as signficant as it once was, is heavily dependent upon comprehensive specimen collections. Research workspace for graduate students, faculty, and visiting scholars who need to be in close proximity to the collections, often must be provided in a museum or gallery facility.

Within these general functions, the facilities required by museum, gallery, and other exhibition programs of an institution are dependent on the size, scope, and rate of growth of collections; the volume of institutional and public use of the facilities; and degrees to which curatorial and research functions are required.

As a final comment, it should be noted that the amount of exhibition space available at an institution may depend very much on the amounts and sources of funds provided for construction of facilities. No specific unit floor area criteria are applicable.

DATA PROCESSING AND COMPUTING FACILITIES

ROOM TYPES INCLUDED:

Data Processing-Computer Facilities

Data Processing-Computer Facilities Service

DISCUSSION:

Data processing and computing facilities in colleges and universities primarily serve three programs:

(1) Instruction in data processing technology and computing science,

(2) Research, and

(3) Institutional support, i.e., data processing services for administration, student services, library operations, and public service programs.

In smaller institutions if a computer installation exists, it serves all three requirements. In larger institutions, separate installations of various types and sizes may be found serving one type of operation; i.e., a system and staff dedicated primarily to instruction and research, a system and staff dedicated primarily to administrative (institutional support) data processing, and sometimes one or more smaller installations serving particular programs of instruction and research. As large scale, time-sharing and multi-processing systems develop, many predict that even in large institutions a single, centralized computing operation will develop, with remote terminals and peripheral input-output equipment serving all kinds of users.

Space requirements for data processing and computer facilities will vary widely with the size and type of equipment, staffing patterns, user services provided, the degree of centralization, and the use of remote equipment.

In 1966, the National Academy of Sciences and the National Reserach Council published a comprehensive study entitled, "Digital Computer Needs in Colleges and Universities." This report includes estimates of the assignable square feet of space needed by four types of computer installations, varying with the size of the installation. The study was based on the use of second-generation computing equipment. Although third-generation computers have been somewhat compacted by solid-state circuitry (also reducing mechanical air conditioning requirements), increased use of specialized peripheral equipment probably has offset the reduction in basic equipment size.

The four types of computer installations are generalized as follows (with some third-generation examples substituted);

- TYPE A: LARGE, high speed, large memory computers (e.g., CDC 6400-6600, IBM 360/65-91, RCA Spectra 70, GE 600) with substantial technical support and user service staff.
- TYPE B: MEDIUM-LARGE, medium-high speed, medium memory (CDC 3300-3600, IBM 360/50, Burroughs 5500, GE 400, PDP 10) with medium-large support and user service staff.
- TYPE C: MEDIUM-SMALL, medium speed, medium-small memory (IBM 360/30-40, XDS SIGMA 3, GE 200) with medium-small support and user staff.
- TYPE D: SMALL, lower speed, medium-small memory (e.g., IBM 1130 or 1800, PDP 8, PDP 8A, NOVA, XDS 930) with small support and user service staff.

The NAS/RCH study recommended the following building space allowances for each of these four types of installations.

TABLE 5.1

GENERAL ASSIGNABLE SQUARE FEET REQUIREMENTS IN COMPUTING CENTERS

	ASSIGNABLE SQUARE FEET			
USE	TYPE A	TYPE B	TYPE C	TYPE D
Computer Room	2,500	2,500	1,500	800
Maintenance Engineers	400	400	200	100
Storage and Duplicating	1,500	1,000	500	200
Ready Room	2,000	1,200	800	400
Dispatching Room	1,000	600	400	200
Keypunch Room	500	500	300	200
Auxiliary Equipment	500	500	200	100
Subtotal	8,400	6,700	3,900	2,000
Library	2,000	1,200	800	400
Conference Rooms	1,200	800	400	200
Offices	11,850	8,500	5,150	650
Subtotal	15,050	10,500	6,350	2,250
Total	23,450 ASF	17,200 ASF	10,250 ASF	4,250 ASF

These allowances should be viewed as useful starting points for planning new computer or data processing facilities requirements. Actual programming, however, will depend upon more careful study and documentation of:

Staff requirements:	Administrative and management
	Systems engineers
	Systems analysts
	Programmers
	User Programming Advisers
	Machine operators
	Keypunch operators
	Clerical and secretarial support
Machine configuration:	Computer room
	Peripheral equipment
Storage requirements:	Disc, tape, and card storage
	Supply storage
User Facilities:	Desk space
	Locker space
	Keypunch and other peripheral equipment
Remote installations:	Remote terminals
	Remote input-output systems
	Links to other computers
Other:	Equipment maintenance facilities
	Conference facilities
	Instructional facilities

Manufacturers of equipment usually provide machine configuration layouts and other space planning aids. Staff offices, conference rooms, and instructional facilities can be programmed in the same manner as they are in other cases. Storage facilities must be programmed according to expected volume of tape, disc, card, and supply requirements. User facilities depend on the expected number of users and the extent to which user facilities will be remote from the central facility.

Computer and data processing facilities can be expected to change in the future, but the nature of change is difficult to predict. A major factor that may be anticipated is the development of massive electromagnetic information storage devices. Already mentioned is the probable increase in time-sharing and remote terminal systems. Interconnected networks of computing systems already are being planned. The planning of facilities for this type of changing technology requires careful attention to adaptability, avoiding the construction of costly fixed facilities that may be outmoded in future cycles of technological development.

GENERAL INSTITUTIONAL FACILITIES

MANUAL FIVE

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INTRODUCTION TO MANUAL FIVE
GENERAL INSTITUTIONAL FACILITIES

Manual Five of the Space Analysis Manuals includes facilities evaluation and projection procedures for several types of general institutional space:

1. Miscellaneous General- and Special-Use Facilities
2. Auxiliary Facilities
3. Student Service Facilities
4. Student Health Facilities
5. Athletic - Physical Education Facilities
6. Supporting Facilities

It appears that Manual Five includes a rather disjoint array of facilities types. The disorder however is more apparent than real. With the exception of the latter, Supporting Facilities, these various facilities, taken together, indicate the institutional view of what a higher education campus should consist. Collectively, they represent the institution's method of providing for "creature comforts" and the whole range of the students' non-academic institutional life. As such, these facilities are subject to a great deal of control and direction by institutional policy- and decision-makers.

Space analysis and projective techniques for these types of facilities, generally, are functions of dollars available as well as load. Miscellaneous General-Use and Special-Use Facilities planning is almost entirely dependent upon source and amount of funds available. Supporting Facilities requirements depend upon the size of the institution and its general needs.

The techniques and procedures, outlined and illustrated on the following pages, will serve as general guidelines to the institutional planner.

MISCELLANEOUS SPECIAL AND GENERAL USE FACILITIES

ROOM TYPES INCLUDED: Assembly Facilities

Armory, Clinic, and Demonstration Facilities

Field Service Facilities

DISCUSSION:

The types of facilities discussed in this section are characterized by an immunity to generalized planning methodologies. On most campuses, these are unique, one-of-a-kind facilities. Where they exist, there is little probability that they will be expanded or duplicated. At institutions where such facilities do not exist but are planned, the planning activities are oriented heavily toward design of a particular facility which will satisfy a particular combination of needs which exist perhaps at that institution alone.

Facilities planning, in the generalized sense, can be accomplished only when some indicator of projected load (such as number of students or faculty or number of student credit hours) is available from which the facilities requirements can be derived. Either the indicators of load for Miscellaneous Special- and General-Use Facilities, are varied, overlap, or are otherwise unclear or there are no generally acceptable procedures available by which facilities requirements can be derived from the projected load data.

Assembly Facilities

Assembly Facilities exemplify the situation in which there is no single, controlling indicator of load. Theaters, auditoria, chapels and other assembly facilities often must satisfy a whole variety of institutional and community needs. They shelter such diverse activities as assemblies and colloquia, theatrical and dramatic productions, musical presentations, student organizational meetings, commencement exercises, religious services, lectures and other formally scheduled instructional activities, public meetings and productions, and even organ practice.

It may be possible to establish a separate load factor for each and every preconceived use of such a facility. Even if possible, however, it is highly unlikely that these load factors could be synthesized in such a way as to provide a basis from which to project these kinds of facilities requirements. A facility designed to house this combination of activities probably will differ in at least one respect from a facility designed to house any selected one of these activities. An auditorium, for example, may result which is too big for a theater, too small to serve all the requirements for an auditorium, has more stage and support space than is required for most auditorium uses and less than desired for a theater, etc. Such a facility may not serve any one of the activities it houses optimally, but in most cases, it can serve most of them adequately.

Even if load factors could be developed for every preconceived use of a facility of this type, they would not provide a sufficient planning base. One of the characteristics of almost all general use facilities is that, once constructed, they are used for many activities which had not been considered previously. That is, they in fact do become General-Use facilities. The uses are so varied and so numerous that it is impractical, if not impossible, to develop a space factor or formula which can indicate to the user how much of this particular type of space he needs. Such space must be tailor-made to the needs of each institution.

Armory, Clinic, Demonstration, and Field Service Facilities

Armory, Clinic, Demonstration, and Field Service Facilities on the other hand exemplify the situation in which load factors in terms of student users can be determined but in which there are no generally acceptable procedures or factors available from which facilities needs can be calculated. In most respects all such facilities can be treated as a "mutant" form of class laboratory. As a result, projected numbers of users for these types of facilities are either the projected number of registrations in specific courses or in all courses offered by certain departments. Normal procedures for projecting instructional loads will yield the projected numbers of enrollments in military science courses and in courses in agriculture, home economics, education, speech therapy, etc., which usually place a demand upon these facilities. However, once these load factors are developed, it is extremely difficult to convert them into space requirements on any basis other than "custom-tailoring."

Part of the problem is multiple user groups. This situation is particularly evident in Demonstration Schools. In these, the amount of space required is determined not only by the number of student teachers to be trained but, more importantly, by the number of elementary and secondary students to be enrolled. The whole realm of problems associated with constructing a facility for elementary or secondary education comes into play. Similar considerations, although to a lesser extent, come into play for clinic facilities.

The requirement for Armory Facilities is partially a function of the extent to which certain of the components of such a facility somehow can be shared. If an indoor drill area is required, can it be provided in a field house and thus shared with an athletic program or must it be included in the armory? Is a rifle range available nearby or must one be constructed? In other words, an armory on one campus may be composed of all facilities required by military science programs. On another campus, facilities designated as Armory Facilities may contain only weapons rooms, supply rooms, and some office and classroom space (which should be labeled and planned). In all probability, planning for armory facilities is a less than pressing problem in this day and age.

Field Service Facilities also represent a unique planning problem. The function of such facilities is to shelter animals or to store and protect farm equipment, products, and supplies. These facilities are so varied in nature (even within this single category) that projection of need for any time into the future is almost impossible.

A final characteristic of all of these types of space is the extent to which actual planning of such facilities is dependent upon prior identification of funding sources. For all types of facilities for which there are no established, fairly rigid relationships between loads and facilities requirements, it is common to find that these facilities are planned on the basis of what the market will bear. With regard to facilities which have multiple uses (such as auditoria), there is no realistic way to specify how many of - nor how well the various requirements are to be satisfied until the financial constraint is specified. Similarly, actual planning of facilities such as Armories and Field Service Facilities, which have very restricted uses, does not begin until the source and amount of funding is identified.

AUXILIARY EXTERPRISE FACILITIES

Auxiliary enterprise facilities are generally considered to be those facilities used in conjunction with the revenue-producing enterprises of an institution. The term normally covers such facilities as dormitories, residence halls, dining halls, student unions, bookstores, university press, etc. For purposes of these manuals, auxiliary enterprise facilities are considered to be residence halls, food service facilities, and student health facilities. The other facilities commonly included in this category (e.g., book-stores and student unions) are treated in the section dealing with other special- and general-use facilities.

Auxiliary enterprises are charactized by an objective of providing goods or services to a user group drawn from members of the campus community, usually in the absence of a suitable alternative source of these goods or services. As a result, an important element in the planning of such facilities is the ability of the surrounding community to provide the services. The requirements for all such facilities are very much determined by factors outside of an institution's control.

The need for the services provided through the auxiliary enterprise operations of an institution are common to all members of the campus community. The services are necessary because of the mere presence of individuals on the campus, not because of any special characteristics (e.g., major or student level). The planning processes which result are more straightforward than those for many other types of space. The process associated with projecting requirements for residential, dining and student health facilities are discussed individually in the following sections.

RESIDENTIAL FACILITIES

ROOM TYPES INCLUDED:

Residence halls for single persons, dormitories, one-family dwellings, multiple family dwellings, and associated service facilities.

DISCUSSION:

Residential facilities represent the largest single category of space at many institutions. Aggregate figures for all institutions in the United States indicate that residential facilities account for more than twice as many assignable square feet of space as the next largest category (except, of course, in the public community colleges which generally have no facilities devoted to student housing). This fact alone lends considerable importance to the techniques used in projecting the need for such facilities and to the care with which these techniques are applied.

Fortunately, the procedures for estimating residential facilities needs are relatively straightforward in comparison to those used to determine requirements for most other types of facilities. In addition, residential facilities represent one of the very few types of space for which there is normally less of a penalty for having too little than for having too much. The economic consequences of having vacant dormitory rooms can be disastrous, whereas the consequences of having too little space is a situation in which students must find accommodations in the surrounding community. Hence, there is a natural tendency for caution when additional residence hall space needs are being projected.

There is but one basic methodology for estimating requirements for residential facilities. The variations in methodology are variations in degree rather than variations in kind. Basically, this methodology consists of:

1) Estimating the number of students to be housed in institutional residence facilities,

2) Ascertaining the capacities of existing facilities, and

3) Determining the additional capacity required.

The variations in the methodology are concerned with the extent to which sub-groups of the student body are identified and used as the basis for planning. The same basic procedures apply when dealing with the broad categories of "married students" and "single students" as when dealing with "single freshman females," "married graduate males" and other such specific groups within the student body.

It should be noted that the procedures for projecting future needs of residential facilities and evaluating their current use are couched almost exclusively in terms of number of stations (or, more commonly, number of beds). For most purposes information on assignable square feet of such facilities is irrelevant. Once the configuration of these facilities has been determined architecturally and construction completed, the capacity is fixed. Data on the area involved are not useful for management purposes.

DISCUSSION

EVALUATION OF EXISTING RESIDENTIAL FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Existing number of stations (units) of single family dwellings
- Existing number of stations (units) of multiple family dwellings
- Existing number of stations (beds) of single student residence space categorized in a manner supportive of the planning processes at the institution.

PROGRAM DATA REQUIRED:

- None

FACILITIES DATA REQUIRED:

A Tabulation of

- Existing residential facilities by type of unit which include
    - Capacity in number of beds or units
    - Restrictions concerning type of residents in the facilities

PROCEDURE:

1. Obtain a tabulation of current residential facilities capacity.

The categories included in this tabulation should be organized to conform with those used in the projection technique. This information is basic to all of the variations of the planning procedures which will be described subsequently. The primary source of the information is the institution's facilities inventory.

Current capacity of each type of residential facility above generally should be readily available from the institution's facilities inventory. Care must be taken to insure that the figures for single student residence facilities reflect design capacities rather than existing number of stations. It is often possible to cram two students into a room designed for one.

If the inventory indicates that the capacity of such a room is two (instead of one), calculations will understate future need by overstating current capacity. As a result, the crowded conditions will be perpetuated. For the family dwelling units, the inventory data is sufficient normally.

Additional data are required only if some of these units are to be reserved for use by individuals other than students. When such a situation prevails, it is necessary to know how many of the existing units will be available for purposes of housing students. For many institutions, however, the summary data on capacity of single student residence halls which can be obtained from the inventory alone are not sufficient. At almost all institutions, housing policies call for providing residence facilities to students on the basis of certain definable student characteristics. The following is an illustrative, but by no means exhaustive, listing of some of these characteristics:

a. Level of student -- e.g., all freshman may be required to live on campus.

b. Age and/or sex of student -- e.g., all female students under age 21 may be required to live on campus.

c. Student major -- e.g., all foreign language majors may be required to live in "language houses."

d. Involvement in extra-curricular activities -- e.g, all varsity athletes may be required to live in special dormitory facilities.

e. Membership in social organizations -- e.g., members of fraternities and sororities may be required to live in the facilities provided by these groups unless there is insufficient capacity.

Obviously, the facilities assigned to each of these identifiable groups need not be tailored uniquely to the specific requirements of these groups. Freshmen and upperclassmen can use the same space. Spanish majors and varsity athletes can live in dormitories having exactly the same physical characteristics. A fraternity house could be assigned to students on the basis of their level as well as on the basis of membership in a social organization. A given dormitory can normally accommodate men as well as women. To paraphrase a witty Dean of Women at a major university, men's dorms can be converted to women's dorms through the simple expedient of planting geraniums in the urinals.

Since the residence facilities do have interchangeable uses, it is impossible (or unwise where it is possible) to rigidly categorize space in accordance with user characteristics. Admittedly, in some situations, this rigidity is necessary. For example, an institution may be required, by contract, to provide a social group with space in a particular facility as long as the group maintains a 90% occupancy factor. Similarly, the location of specialized equipment in a dormitory may preclude its use as anything other than a "language house." Such restrictions are the exception rather than the rule, however.

In order to categorize the single student residence facilities in a manner which accommodates the variations of the planning process and also reflects the interchangeability of possible uses, it is suggested that the categorization be based on the physical unit. In some instances, the unit would be an entire dormitory. In other instances, the unit would be a wing or a floor of a building. At the extreme a "unit" would be a single room.

To describe the single student residence facilities according to this scheme, it is necessary to provide the following information:

a. Name or other description of the unit

b. Capacity (number of beds or number of units)

c. Restrictions as to assignment

Generally, units for married students are not assigned on any characteristic other than the fact the student is married. Capacity of married student units usually is described in terms of the number of bedrooms available in the unit.

2. Verify the tabulation of current residential facility capacity with the institution's student housing office.

   It is possible that inventory records and housing office records may be out of "sync" with one another so it is best to maintain a cross-check between the two sources of information.

3. Evaluate the current utilization of residential facilities.

   Utilization of housing facilities is monitored on a more or less constant basis at most institutions. Most housing offices have current records on number of vacancies in each type of residence facility. Similarly, current records of number of students assigned to each of the housing units are also commonly maintained.

Evaluation of current utilization is the simple matter of comparing numbers of residents with total number of beds available. Since it is sometimes possible to overassign residents in a particular facility and since capacity should be expressed in terms of design capacity, it is theoretically possible to have a utilization rate in excess of 1.0 at an institution faced with a shortage of housing.

EXAMPLE

EVALUATION OF EXISTING RESIDENTIAL FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Existing number of stations (units) of single family dwellings
- Existing number of stations (units) of multiple family dwellings
- Existing number of stations (beds) of single student residence space categorized in a manner supportive of the planning processes at the institution.

PROGRAM DATA REQUIRED:

- None

FACILITIES DATA REQUIRED:

A tabulation of

- Existing residential facilities by type of unit which includes
    - Capacity in number of beds or units
    - Restrictions concerning type of residents in the facility

PROCEDURE:

1. Obtain a tabulation of current residential facility capacity.

TABLE 3.1

TABULATION OF CURRENT RESIDENTIAL FACILITY CAPACITY

RESIDENTIAL FACILITY	CAPACITY	RESTRICTIONS
1. Building 1 - Harpur	192 Beds	--
2. Building 2 - Hale	140 Beds	--
3. Building 3 - Hamilton	150 Beds	--
4. Building 4 - Hanson	43 Beds	Foreign Language Majors
5. Building 5 - Sigma	44 Beds	Sigma Alpha Chi Fraternity
6. Building 6 - Beta	36 Beds	Beta Phi Fraternity
7. Building 7 - Pi	48 Beds	Pi Alpha Theta Fraternity
SINGLE STUDENT SUBTOTALS	653 Beds	--
8. Dawn Houses	50 Units	10 - Efficiency 20 - 1 Bedroom 15 - 2 Bedroom 5 - 3 Bedroom
TOTAL	653 Beds 50 Units	--

2. Verify the tabulation of current residential facility capacity with the institution's student housing office.

   The tabulation is the same as that maintained in the housing office.

3. Evaluate the current utilization of residential facilities.

TABLE 3.2
CURRENT UTILIZATION OF RESIDENTIAL FACILITIES

RESIDENTIAL FACILITY (1)	CAPACITY (2)	RESIDENTS (3)	VACANCIES (2)-(3)=(4)
1. Harpur Quad.	192 Beds	178	14 Beds
2. McKinney Quad.	140 Beds	140	0 Beds
3. Baird Hall	150 Beds	136	14 Beds
4. Westdyke Hall	43 Beds	37	6 Beds
5. Sigma House	44 Beds	39	5 Beds
6. Beta House	36 Beds	35	1 Bed
7. Pi House	48 Beds	40	8 Beds
SINGLE STUDENT SUBTOTALS	653 Beds	605 Residents	48 Beds
8. Dawn Houses	10 Efficiency 20- 1 Bedroom 15- 2 Bedroom 5- 3 Bedroom	10 Families 19 Families 15 Families 3 Families	0 Units 1 Unit 0 Units 2 Units
MARRIED STUDENT SUBTOTALS	50 Units	47 Families	3 Units
TOTALS	653 Beds 50 Units	605 Residents 47 Families	48 Beds 3 Units

DISCUSSION

DETAILED METHOD

PROJECTION OF RESIDENTIAL FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Number of additional family units required
- Number of additional single student residence hall stations (beds) required.

  The estimates of number of additional single student beds required should be subdivided to indicate the specific groups of students for which the added space is required.

PROGRAM DATA REQUIRED:

- Statement of housing policy which specifies the various categories of students for whom (some) space is to be provided.
- Projected total number of students in each of the identified categories.

FACILITIES DATA REQUIRED:

- Total number of family dwelling units available
- Total number of single student residence hall stations (beds) available.

JUDGMENTS REQUIRED:

- Number of the family dwelling units to be available for use by married students.
- Number of single student residence hall beds to be available for use by students. Less than full availability normally results from a practice of reserving some spaces for faculty, visiting guests, or individuals enrolled in short courses or special programs.
- Proportion of each of the categories of students identified in the statement of housing policy to be provided space in institution-owned residential facilities.

In most instances, not all of the students in the defined categories will be provided with on-campus residential space. This situation arises either as a matter of established policy ("it is the objective of the institution to house 60% of the undergraduate student population") or because there are exceptions to almost all policies ("the institution will house all freshman except those who choose to commute").

When establishing policy regarding proportions of each category of students to be housed, the following factors are normally considered:

1. The Institution's Academic Philosophy -- especially as related to a dedication to the 24-hour-a-day learning environment;
2. Institutional Clientele -- very localized versus statewide, regional, or national;
3. Institutional Location -- urban or rural;
4. Housing Alternatives -- specifically, is there sufficient housing available in the surrounding community to accommodate any students not housed on the institution's campus (many rural and small-town colleges must necessarily provide housing for a majority of their students because no alternative residential facilities are available).

PROECEDURE:

1. Obtain, as outputs of the program planning and analysis procedures (discussed in Manual Six), projections of
   a. number of married students,
   b. number of single students, categorized according to characteristics specified in the institutions' statement of housing policy.
2. Specify the proportion of each of these categories of students to be housed in institutionally-owned facilities.
3. Calculate the number of students of each category to be housed.

   Multiply the total projected number of students in the category by the proportion of students in the category to be housed.
4. Determine additional number of stations (units or beds) to be provided. This determination consists of comparing the available stations with the calculated number of required stations.

COMMENTS ON THE PROCEDURE:

The wide variations in housing policies which are found from institution to institution preclude a complete description of the detailed method for projecting an institution's residence hall requirements. Because so much depends on the institution's policies regarding what proportions of which groups of students will be afforded housing accommodations and because there is so little commonality with regard to these policies, the procedures can be described only generally. A specific format which predetermines each of the categories is not possible. It is intended that the general description of the detailed procedures, when illuminated by an illustration, will provide sufficient insight into the methods to allow their use by the institutional administrators.

EXAMPLE

DETAILED METHODS

PROJECTION OF RESIDENTIAL FACILITIES REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- number of additional family units required
- number of additional single student residence hall stations (beds) required.

PROCEDURE:

1. Obtain, as outputs of the program planning and analysis procedures, projections of
   - number of married students
   - number of single students, categorized according to characteristics specified in the institution's housing policy.

TABLE 3.3

PROJECTIONS OF MARRIED AND SINGLE STUDENTS BY LEVEL OF STUDENT

TYPE OF STUDENT	SEX	FRESHMEN	SOPHOMORE	JUNIOR	SENIOR	TOTAL
1. Married	1. Male 2. Female	-- --	-- --	40 15	90 5	130 20
MARRIED SUBTOTAL		--	--	55	95	150
2. Single	1. Male 2. Female	483 398	387 259	232 166	168 157	1270 980
SINGLE SUBTOTAL		881	646	398	325	2250
TOTAL		881	646	453	420	2400

2. Specify the proportion of each of these categories of students to be housed in institutionally-owned facilities:

   a. Married Students - 50%

   b Single Students

      1a. Fraternities - 3 current men's (128) plus 1 expected sorority (projected 50) have total capacity for 178 students - predict 90% occupancy.

      1b. Language house - 43 beds, 100% occupancy.

      1c. 50% of freshmen live on campus in residential facilities. All other freshmen are instate.

      1d. 40% of all single students to be provided housing in institutionally-owned facilities.

3. Calculate the number of students of each category to be housed.

   a. Married Students - 50%
   therefore

	Juniors	Seniors	Total
Men	20	45	65
Women	7	3	10
Total	27	48	75

   b. Fraternities - 90% x 178 = 160 occupied.

   The expected distribution of these students is:

	Sophomores	Juniors	Seniors	Total
Men	60	40	15	115
Women	25	15	5	45
Total	85	55	20	160

   c. Language House - 43 beds, distribution predetermined.

	Juniors	Seniors	Total
Men	10	10	20
Women	11	12	23
Total	21	22	43

   d. 50% of Freshmen, or

483	Men
398	Women
881	Total x 50 = 441 beds

e. 40% of all single students, or

.40 x 2250 = 900 beds

Beds already accounted for:

Freshman	441
Fraternities	160
Language	43
	644 Beds

Beds remaining to be occupied by others - 256.

4. Determine additional number of stations (units or beds) to be provided:

TABLE 3.4

ADDITIONAL STATIONS REQUIRED

Student Category	Projected Stations Needs	Current Stations Available	Additional Stations Needed
Married Students	75 units	50 units	25 units
Fraternity Stations	160 beds	128 beds	32 beds
Language House Stations	43 beds	43 beds	--
Freshmen Stations	441 beds	441 beds	--
All other*	256 beds	44 beds	215 beds
TOTALS	900 beds 75 units	653 beds 50 units	247 beds 25 units

*To bring single student station count to 900 station total.

DISCUSSION
GENERAL PLANNING METHOD
PROJECTION OF RESIDENTIAL FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Number of additional family units required
- Number of additional single student residence hall stations (beds) required.

PROGRAM DATA REQUIRED:

Projected total numbers of:

- Married students
- Single students

FACILITIES DATA REQUIRED:

- Total number of family dwelling units currently available
- Total number of single student residence hall stations (beds) currently available.

JUDGMENTS REQUIRED:

- Number of family dwelling units to be available for use by married students
- Number of single student dormitory beds actually available for use by students
- Proportion of total number of married students to be housed on campus
- Proportion of total number of single students to be housed on campus.

The estimated proportions of married and single students to be housed are planning factors based on current proportions which have been adjusted to account for forseeable changes in operating practices. These estimated proportions reflect the summation of the housing policies which are applied to much more detailed groups of students. The single student proportion is not normally a reflection of a housing policy statement.

PROCEDURE:

1. Obtain, as outputs of the program planning and analysis procedures (discussed in Manual Six, Sections 2.0 and 3.0), projections of

    a. Total number of married students

    b. Total number of single students

2. Specify the proportions of both single and married students to be housed in institutionally-owned facilities.

3. Calculate the number of students in each of the two categories to be housed.

    This calculation is accomplished by multiplying the projected number of students in each category by the estimated proportion of students in the category to be provided with housing accommodations.

4. Determine additional number of stations (family units or dormitory beds) required.

    This determination consists of subtracting the currently available number of stations of each type from the projected required number of family units and single student residence hall stations.

COMMENTS ON THE PROCEDURE:

A large number of planning methodologies which conceptually are similar to the methods discussed, but which are different in detail, lie between the extremes represented by the detailed and general planning methods (these procedures are more detailed than the general planning methods and less detailed than the detailed methods described). The only significant differences are variations in the number of categories of single students selected as the basis for planning. The most common additional differentiation is by sex of the student. Rather than estimating the requirements for all single students, the housing needs of the single female and single male students are estimated independently. Another common differentiation is by level of student, especially by undergraduate and graduate categories.

The unique requirements of each institution must dictate the categories selected for planning purposes. As with all such procedures, the fewer the number of categories which are used, the easier, and probably the more accurate, the planning will be.

The procedures explained above may be described as the "positive" approaches to the planning of residential facilities. Calculation of the additional number of housing units required is based on a statement of what proportion of which groups of students the institution wishes to house on its campus.

There is an alternative approach which is based on an analysis or estimate of how students in which categories must be housed on campus because of the lack of availability of alternative housing. In view of the questionable economic feasibility of constructing residence facilities and the declining student demand for campus housing, such an approach has a great deal of merit and validity.

The procedures associated with such a philosophy are very similar to the procedures previously described. Specifically, such an approach requires that the following steps be taken:

1. Obtain, as outputs of the program planning and analysis procedures, projections of
    a. Total number of married students
    b. Total number of single students categorized into subgroups as necessary. Again, categorization of single students by sex is probably most common.
2. Specify number of existing units available to house the students of each category.
3. Subtract the number of students of each category who can be housed in existing facilities from the projected total number of students in each of these categories. The sum of the differences is the number of students for whom housing is required.
4. Determine (or estimate) the extent to which these students can be housed off-campus. At some institutions a very rigorous analysis of off-campus housing availability is conducted. At others the ability of the community to absorb the housing of students is determined strictly by seat-of-the-pants estimation. Regardless of technique, the result is an indication that the community indeed can house the total number of students requiring off-campus residential space or that the community can absorb a number less than the total. Those remaining students will require facilities provided by the institution.

In the final analysis, the process for estimating residence hall requirements is a combination of procedures. At most institutions, a positive housing policy is associated with certain categories of students (e.g., single undergraduate females) while housing is provided for other categories of students (e.g., single graduate males) only if their requirements cannot be satisfied off-campus. Regardless, the methodology is basically similar to that described previously. The minimum residential facilities requirements for housing these students for which the institution has made a positive commitment are first calculated. Then the ability of the community to shelter the students for whom the institution would prefer not to provide housing are determined.

EXAMPLE

GENERAL PLANNING METHOD

PROJECTION OF RESIDENTIAL FACILITIES REQUIREMENTS FOR AN EXISTING INSTITUTION

DATA TO BE DETERMINED:

- Number of additional family units required
- Number of additional single student residence hall stations (beds) required

PROCEDURE:

1. Obtain, as outputs of the program planning and analysis procedures, projections of

    - Total number of married students
    - Total number of single students

    a. At the 2400 student level it is estimated that there will be 150 married students.

    b. At the 2400 student level, it is estimated that there will be 2250 single students.

2. Specify the proportions of both single and married students to be housed on campus.

    a. 50% of the married students will be provided with campus housing.

    b. 40% of the single students will be provided with campus housing facilities.

3. Calculate the number of students in each of the two categories of students to be housed.

    a. .50 x 150 married students = 75 married students to be housed
    = 75 units

    b. .40 x 2250 = 900 single students to be housed

4. Determine additional number of stations (family units or dormitory beds) required.

TABLE 3.5

ADDITIONAL RESIDENTIAL STATIONS REQUIRED

Student Category	Projected Units or Beds Required	Currently Available Units or Beds	Additional Units or Beds Required
1. Married students	75 units	50 units	25 units
2. Single students	900 beds	653 beds	247 beds

DINING FACILITIES

ROOM TYPES INCLUDED:

Food service facilities, food service facilities service, and dining facilities in dormitories (room type codes 630, 635, and 912).

DISCUSSION:

The room type structure included in the Higher Education Facilities Manual makes a distinction between those dining facilities which are included as part of a dormitory complex (and restricted to use by residents of the associated dormitories) and those which are open to a wider clientele. For purposes of most analyses this distinction is unnecessary. The procedures to be described on the following pages generally treat dining facilities without reference to this distinction. Where relevant, however, the distinction will be recognized.

In general, the procedures require projection of the loads to be placed on the dining facilities and assessment of the ability of current facilities to accommodate this projected level of activity. If current facilities are found to be insufficient, these procedures will indicate the minimum additional number of dining stations required. However, efficiencies of operation normally are such that dining facilities are added in rather large increments. As a result, operational considerations commonly dictate the characteristics of the dining facility as it is eventually constructed. These procedures indicate minimum requirements which must be satisfied as of the time period for which the projection is being made.

As is the case with residential facilities, variations in the methodology are based on the extent to which specific clientele are identified and used as the basis for planning. All methodologies, however, are operationally and conceptually similar. Again, they vary in degree rather than in kind. Moreover, capacities of dining facilities are expressed almost exclusively in terms of number of stations and the maximum number of diners who can be accommodated at these stations for a single meal.

DISCUSSION

EVALUATION OF EXISTING DINING FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Maximum number of diners that can be accommodated at each of an institution's dining facilities

PROGRAM DATA REQUIRED:

- Average number of meals served for each meal of the day

FACILITIES DATA REQUIRED:

- Number of stations in each of an institution's dining facilities

JUDGEMENTS REQUIRED:

- Maximum number of "turnovers"* which can be achieved for each principal meal of the day at each facility.

PROCEDURE:

1. Obtain a tabulation of the number of dining stations in each of the institutions facilities.

   This tabulation should be readily obtainable from the institution's facilities inventory.

2. Determine the maximum number of turnovers for each dining facility for each meal of the day.

   Maximum number of turnovers is calculated by dividing the length of the serving period for each meal by estimated shortest comfortable length of time it takes an average individual to eat that meal. This should be done in consultation with the director of dining facilities.

   It should be noted that the maximum number of turnovers which can be achieved is a function of both length of the serving period and time required per diner. To some extent both of these variables are controllable. For example, the time required per diner can generally be reduced if cafeteria service is provided instead of table service. Similarly the length of the serving period is unnecessarily limited if the class schedule is constructed so as to force most students into a 12:00 to 1:00 lunch period.

---

*Turnovers are defined as "the maximum number of times each station can be used during the serving of a single meal."

3. Calculate the maximum capacity for each dining facility for each meal.

   Maximum capacity is the product of the maximum possible number of turnovers and the number of dining stations available in each facility.

4. Obtain a record of the average number of meals served for each meal of the day.

   The source for this information is the institution's director of dining facilities. These persons generally maintain rather complete and accurate records of meals served.

5. Compare the calculated capacity with the current rate of use of the dining facilities.

EXAMPLE

EVALUATION OF EXISTING DINING FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Maximum number of diners that can be accommodated at each of an institution's dining facilities

PROGRAM DATA REQUIRED:

- Average number of meals served for each meal of the day

FACILITIES DATA REQUIRED:

- Number of stations in each of an institution's dining facilities

JUDGMENTS REQUIRED:

- Maximum number of "turnovers"* which can be achieved for each principal meal of the day at each facility.

PROCEDURE:

1. Obtain a tabulation of the number of dining stations in each of the institutions dining facilities.

TABLE 3.6

STATIONS AVAILABLE IN DINING FACILITIES

DINING FACILITY	STATIONS
1. Crosswell Hall	300
2. Harpur Dining	200
3. Sigma House	44
4. Beta House	36
5. Pi House	48
6. Rathskeller	50
TOTAL	678 Stations

---

*Turnovers are defined as "the maximum number of times each station can be used during the serving of a single meal."

2. Determine the maximum number of turnovers for each dining facility for each meal of the day.

TABLE 3.7

MAXIMUM NUMBER OF TURNOVERS FOR EACH MEAL

Meal (1)	Facility (2)	Length of Serving Period (3)	Shortest Comfortable Eating Time (4)	Turnovers (Maximum) (3)÷ (4)=5
Breakfast	Crosswell Hall	60 Min.	20 Min.	3
	Harpur Dining	60 Min.	20 Min.	3
	Sigma House	45 Min.	45 Min.	1
	Beta House	45 Min.	45 Min.	1
	Pi House	45 Min.	45 Min.	1
	Rathskeller	--	--	--
Lunch	Crosswell Hall	90 Min.	30 Min.	3
	Harpur House	90 Min.	30 Min.	3
	Sigma House	45 Min.	45 Min.	1
	Beta House	45 Min.	45 Min.	1
	Pi House	45 Min.	45 Min.	1
	Rathskeller	120 Min.	15 Min.	8
Dinner	Crosswell House	90 Min.	45 Min.	2
	Harpur Dining	90 Min.	45 Min.	2
	Sigma House	60 Min.	60 Min.	1
	Beta House	60 Min.	60 Min.	1
	Pi House	60 Min.	60 Min.	1
	Rathskeller	--	--	--

3. Calculate the maximum capacity for each dining facility for each meal.

TABLE 3.8

MAXIMUM CAPACITY FOR EACH FACILITY FOR EACH MEAL

Meal (1)	Facility (2)	Stations (3)	Max. Turnover (4)	Max. Capacity (3)x(4)=5
Breakfast	Crosswell House	300	3	900
	Harpur Dining	200	3	600
	Sigma House	44	1	44
	Beta House	36	1	36
	Pi House	48	1	48
	Rathskeller	50	--	--
	TOTAL	678	--	1628
Lunch	Crosswell House	300	3	900
	Harpur House	200	3	600
	Sigma House	44	1	44
	Beta House	36	1	36
	Pi House	48	1	48
	Rathskeller	50	8	400
	TOTAL	678	--	2028
Dinner	Crosswell House	300	2	600
	Harpur House	200	2	400
	Sigma House	44	1	44
	Beta House	36	1	36
	Pi House	48	1	48
	Rathskeller	50	--	--
	TOTAL	678	--	1128

4. Obtain a record of the average number of meals served for each meal of the day.

TABLE 3.9

AVERAGE NUMBER OF MEALS SERVED FOR EACH MEAL OF THE DAY

FACILITY	AVERAGE NUMBER OF MEALS		
	Breakfast	Lunch	Dinner
1. Crosswell Hall	510	540	570
2. Harpur Dining	406	413	421
3. Sigma House	38	43	43
4. Beta House	30	32	34
5. Pi House	41	43	45
6. Rathskeller	--	330	--

5. Compare the calculated capacity with the current rate of use.

TABLE 3.10
COMPARISON OF MAXIMUM CAPACITY AND CURRENT RATE OF USE

Meal (1)	Facility (2)	Max. Capacity (3)	Current Use (4)	Difference (3)-(4)=5
Breakfast	Crosswell Hall	900	510	390
	Harpur Dining	600	406	194
	Sigma House	44	38	6
	Beta House	36	30	6
	Pi House	48	41	7
	Rathskeller	--	--	
	TOTAL	1628	1025	603
Lunch	Crosswell House	900	540	360
	Harpur Dining	600	413	187
	Sigma House	44	43	1
	Beta House	36	32	4
	Pi House	48	43	5
	Rathskeller	400	330	70
	TOTAL	2028	1401	627
Dinner	Crosswell House	600	570	30
	Harpur House	400	421	-21
	Sigma House	44	43	1
	Beta House	36	34	2
	Pi House	48	45	3
	Rathskeller	--	--	
	TOTAL	1128	1113	15

DISCUSSION

DETAILED METHOD

PROJECTION OF DINING FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Additional number of dining stations required to serve each of the defined groups of users.

PROGRAM DATA REQUIRED:

- Projected number of individuals in each of the defined groups of users.

FACILITIES DATA REQUIRED:

- Number of stations available in each of the institution's existing dining halls.

CAPACITY DATA REQUIRED:

- Number of diners that can be served at each dining hall for each meal of the day.

JUDGMENTS REQUIRED:

- Estimated maximum proportion of the total number of users of each dining facility who will, in fact, eat each of the meals offered during the day.

PROCEDURE:

1. Obtain, from information available as a result of the program planning and analysis procedures, estimates of the total number of individuals in each of the groups which have been identified as being served in the various dining facilities.

   Board policies at most institutions are such that the majority of the dining facilities are assigned for use by well-defined clientele groups. Some dining halls are restricted for use by residents of a particular dormitory complex; the dining areas in fraternity and sorority houses are used only by members of those houses; the faculty club is used only by faculty members and non-academic professionals. In addition, one or more of the dining halls or snack bars commonly are made available for use by students who live off-campus, employees, etc. The combinations of these arrangements practiced at various institutions are practically limitless. As a result, each institution must specify the clientele groups appropriate to its food service policies. As a minimum, these categories usually include dormitory residents (subdivided according to categories appropriate to use of existing dining facilities), students living off-campus, and faculty and other employees.

2. Estimate the maximum proportions of each of the user groups which will place a demand on dining facilities for each meal of the day.

   Seldom, if ever, do all possible users avail themselves of services provided at a dining hall at any given meal (especially breakfast). Fortunately, the food service managers at most institutions keep rather meticulous records of the number of persons served at each meal. In facilities which cater to both "contract board" and "cash customers," the information on the number of meals served is normally categorized to reflect this distinction.

   At some institutions these factors may be quite high. In this case planning should be done on the assumption that all possible users will, indeed, use the facility. The "no-shows" provide a small planning margin-of-safety. At other institutions, these proportions may be relatively small. Construction of dining facilities sufficiently large to accommodate all possible users would result in excessive amounts of space under these conditions.

3. Calculate the estimated maximum number of users of each facility for each meal of the day.

   The estimated maximum number of users of each facility for each meal of the day is the product of the total number of users in each group (from step 1) and the estimated maximum proportions of each group to use the dining facilities (from step 2).

4. Compare the projected demand on each facility with the calculated capacity of each facility. Also compare total demand with total capacity.

5. Determine those situations in which demand exceeds capacity and investigate alternative solutions.

   Construction of additional facilities is only one solution to the problem of insufficient capacity in one or more dining halls. If the total capacity is not exceeded by the total estimated demand, the solution may well be as simple as redistributing some of the potential users to dining halls different from those to which they would be assigned normally.

A second solution is to attempt to reduce the demand. While this may not be feasible at many institutions, removal of the strict board contract requirements, for instance, normally will tend to reduce the number of users.

Operational changes can also be instituted in an attempt to create additional capacity in existing facilities. Lengthening the period of operation and changing the methods of serving to shorten the time required to serve each person are examples of such operational changes.

Finally, construction of new facilities eventually may be required to solve the problem of insufficient dining facilities capacity. Sufficient stations must be provided to accommodate at least the projected excess demand. The number of stations actually added depends on a wide variety of factors. Additional dining facilities may be provided in conjunction with a new dormitory complex. Accordingly, the capacity would be tailored to the number of residents rather than to the number of stations required to satisfy the projected excess demand for the institution as a whole.

COMMENTS ON THE PROCEDURE:

Throughout the discussion on capacities of existing facilities, capacity has been assumed to be determined by the number of dining stations available and the frequency with which they can be used. However, the pragmatic considerations of kitchen and serving line capacities may be equally important. As a result, care must be taken to insure that capacities do not exceed the capacities of the service space. Specifically, the opinion of the food service manager should be solicited before such capacity estimates are used as a fundamental aspect of the planning process.

In addition, at some institutions, particularly community colleges, dining facilities serve multiple purposes. In particular, they often serve as study facilities or even as laboratories in conjunction with food-service-related instruction. As a result, the serving hours cannot be expanded without interference with these other uses. When facilities which have mutliple uses become overcrowded, either additional dining areas must be constructed or new space to house one or more of the other functions must be added.

EXAMPLE

DETAILED METHOD

PROJECTION OF DINING FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Additional number of dining stations required to serve each of the defined groups of users.

PROCEDURE:

1. Obtain, from information available as a result of the program planning and analysis procedures, estimates of the total number of individuals in each of the groups which have been identified as being served in the various dining facilities. (Shown on Table 3.11, columns 1 and 2).
2. Estimate the maximum proportions of each of the user groups which will place a demand on dining facilities for each meal of the day. (Shown on Table 3.11, columns 3, 5, and 7).
3. Calculate the estimated maximum number of users of each facility for each meal of the day. (Shown on Table 3.11, columns 4, 6, and 8).

TABLE 3.11
REQUIREMENTS FOR FOOD SERVICE FACILITIES

Facility (1)	Projected Number of Users by Category (2)	Meal #1		Meal #2		Meal #3	
		Percent of Users (3)	Number of Users (2)x(3)=4	Percent of Users (5)	Number of Users (2)x(5)=6	Percent of Users (7)	Number of Users (2)x(7)=8
Crosswell House							
Residence Students	285	90%	256	95%	271	95%	271
Faculty & Staff	120	10%	12	50%	60	10%	12
Off-Campus Students	700	15%	105	65%	455	10%	70
Subtotal	1105	---	373	---	786	---	353
Harpur Dining							
Residence Students	500	90%	450	95%	475	95%	475
Language House Students	43	95%	41	95%	41	95%	41
Subtotal	543	---	491	---	516	---	5.6
Sigma House							
Members	90	45%	40	45%	40	40%	36
Beta House							
Members	70	50%	35	50%	35	45%	32
Pi House							
Members	100	45%	45	45%	45	40%	40
Rathskeller							
Off-campus Students & Staff	400	---	0	75%	300	---	0
Subtotal	660	---	120	---	420	---	108
TOTAL	2308	---	984	---	1722	---	977

4. Compare the projected demand with the calculated capacity of each facility. Also compare total demand with total capacity.

TABLE 3.12

COMPARISON OF PROJECTED DEMAND WITH CALCULATED CAPACITY

Dining Faculty	Meal #1		Meal #2		Meal #3	
	Projected Demand(1)	Calculated Capacity(2)	Projected Demand(1)	Calculated Capacity(2)	Projected Demand(1)	Calculated Capacity(2)
1	2	3	4	5	6	7
1. Crosswell House	373	900	786	900	353	600
2. Harpur Dining	491	600	516	600	516	400
3. Sigma House	40	44	40	44	36	44
4. Beta House	35	36	35	36	32	36
5. Pi House	45	48	45	48	40	48
6. Rathskeller	0	0	300	400	0	0
TOTALS	984	1628	1722	2028	977	1128

(1) "Projected demand" figures were calculated on Table 3.11 columns 4, 6 and 8.

(2) "Calculated capacity" figures were calculated on Table 3.8.

5. Determine those situations in which demand exceeds capacity and investigate alternative solutions.

Capacity exceeds projected demand for each dining facility.

DISCUSSION

GENERAL PLANNING METHOD

PROJECTION OF DINING FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Projected dining station "turnover" rate

PROGRAM DATA REQUIRED:

- Projected number of diners to be served at each meal of the day.

CAPACITY DATA REQUIRED:

- Number of diners who can be accommodated at all of the institution's dining facilities for each meal of the day.

JUDGMENTS REQUIRED:

- Adequacy of projected dining station "turnover" rate.

PROCEDURE:

1. Estimate the projected maximum number of diners at the largest meal of the day.

   The food service manager should be able to indicate both the largest meal of the day and the percentages of the major user groups which come to that meal.

2. Determine the capacity in number of dining stations for the existing dining facilities.

3. Calculate the projected turnover rate based on the projected maximum number of users at the largest meal.

4. Evaluate the projected turnover rate.

COMMENTS ON PROCEDURE:

The general planning method for estimating the requirements for dining facilities is of the same form as the detailed method previously discussed. The only difference is that this shorter method is concerned with total demand and total capacity. The detailed method is concerned with the demand placed upon each of the facilities and the capacity of the facility to handle this demand.

This procedure has the benefit of simplicity, but does not include the detail necessary for good management. Even in those situations in which the outcomes of the procedure indicate sufficient capacity to meet the projected demand, there may be some facilities which would be over-utilized and others under-utilized if current dining patterns were continued. As a result, an outcome which indicates sufficient capacity may be masking serious dislocations between demand and supply. Application of the detailed method is necessary to expose the true nature of any shortage of dining facilities. Where insufficient capacity is indicated, the alternatives are to add capacity by either construction of new space, to make more intensive use of present space, or to reduce demand in some way.

In cases in which construction of new facilities is chosen as the solution to the problem, the minimum number of additional stations required is computed by dividing the number of diners in excess of the capacity by the number of turnovers appropriate for the meal. This calculation should be made for each of the primary meals of the day.

EXAMPLE

GENERAL PLANNING METHOD

PROJECTION OF DINING FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

•Additional dining stations required

PROCEDURE:

1. Estimate the projected maximum number of diners at the largest meal of the day.

TABLE 3.13

ESTIMATED PROJECTED NUMBER OF DINERS AT THE LARGEST MEAL

User Category (1)	Total (2)	Estimated Percentage to use Facility (3)	Established Number of Users (2)x(3)=4
1. Student Body	2400	50%	1200
2. Faculty & Staff	301	30%	90
Total	2701	--	1290

2. Determine the capacity in number of dining stations for the existing facilities.

   Current dining stations = 678

3. Calculate the projected turnover rate based on the projected number of users at the larges meal.

$$\text{Projected Turnover Rate} = \frac{\text{Maximum Number of Users}}{\text{Current Dining Stations}}$$

$$\text{Projected Turnover Rate} = \frac{1290}{678} = \underline{\underline{1.9}}$$

4. Evaluate the projected turnover rate.

   The projected turnover rate appears to be satisfactory.

STUDENT SERVICE FACILITIES

ROOM TYPES INCLUDED:

Lounge, lounge service, recreation, recreation service, merchandising facilities, merchandising facilities service.

DISCUSSION:

The majority of student service facilities are normally contained within a student union building or a student center. As a result of the common location of so many of these facilities, projecting the need for student service space is almost synonymous with projecting the need for a student union. It is not completely synonymous since it is not unusual to find lesser amounts of lounge and commons space at scattered locations throughout the campus.

The single facility orientation of these types of space and the nature of the activities they house, lead to a somewhat different planning process than is appropriate for most other types of space.

1. The determination of utilization or current capacity in terms of the criteria applied to most other types of facilities is almost impossible. There are no means for quantifying the capacities of most such facilities. The facility may be considered to be operating in excess of its capacity if it is blantantly obvious that current facilities are much too limited in recreational offerings or are bulging from overuse.

2. There is no definable indicator of load for such facilities. There is no way of estimating the numbers of users of the chairs in the lounge or at the ping-pong tables in the recreation room.

As a result of these two very basic differences, the planning process for student service facilities is unlike that for most other types of space. In fact, the planning process for student service facilities perhaps may be described best as "planning in reverse." Generally, planning follows the logical sequence of estimating future loads, determining the facilities required to handle these loads, and finally, calculating the funding requirements. However, for student service facilities, it is common to start with either a specification of funding availability or a maximum total allowable area for the facility. The procedure then becomes one of working backward toward a detailed description of what can be provided within the funding or the area constraints.

The reversal of the process has considerable merit in planning student service facilities. In all probability, unless the constraints were established initially, the planning process would be so open-ended that final resolution would require excessive amounts of time and energy. The planning for a student center normally starts with the creation of a wish list. Many people will have suggestions and differing ideas about what should and/or should not be included. Since the exact nature of a student center on any given campus is determined more by philosophy, policy, and a perceived demand for access to certain activities and services than by programmatic considerations, there is no simple way of screening the various suggestions. As a result, all such suggestions tend to appear on the initial list. There is a space requirement associated with each item on this list. In fact, for many of these items there is a very rigid space requirement. For example, the amounts of space required for bowling alleys, ping-pong tables, etc. are fixed and not subject to modification.

Without imposition of some form of constraint, there is no motivation for establishing priorities among the items on the list nor is there a yardstick available which indicates where to draw the line between what is to be included and what is not. To be most useful, this constraint should be expressed in terms of assignable square feet.

Institutions in several states are guided by a constraint determined on the basis of assignable square feet allowed per full-time equivalent student. It is common for the allowances to be in the neighborhood of 8-10 assignable square feet per FTE student. Thus for an institution of 10,000 FTE students, 80,000 to 100,000 assignable square feet would represent the constraint. The institution is free to specify the activities to be housed within this space. Section 3.5 in this manual includes the specifics of a few unit floor area criteria available which apply to this particular type of space.

At many institutions, this constraint is expressed initially in terms of a funding limitation. However, given a limitation in this form, it is relatively easy to convert to assignable square feet by dividing the amount of funds by an estimated cost per assignable square foot.

In summary, the planning of student service facilities is a matter of determining what the traffic will bear and planning the specifics accordingly.

Those few states that have published assignable square feet per FTE student factors for student service space recognize that not all such space is contained within a student union building. As a result a modest allowance (on the order of 1-2 assignable square feet per FTE student) is made for lounge and other student space at scattered locations on the campus. In addition, for non-residential institutions, such as community colleges, an extra 1-2 assignable square feet per FTE student is allowed for locker space. This allowance is justified easily on the basis that the commuting student does not have a dormitory room available for use during the day and it is unreasonable to ask him to carry around all the books and supplies needed for an entire day's classes.

On a long-term basis, detailed planning of such facilities is not warranted. The amount of such space available should be known. The estimated total needs should be calculated on the basis of the assignable-square-feet-per-FTE-student factor. Any discrepancies between those two values can then be used as the basis for making decisions concerning the necessity for including such space in any new buildings being planned.

DATA TO BE DETERMINED:

- Estimated assignable square feet of student service facilities

PROCEDURE:

1. Develop, select, or adopt facilities planning criteria for student service spaces which reflect the wishes of the institution.

2. Calculate the estimated student service facilities requirements based on the projected student enrollment.

EXAMPLE

PROJECTION OF STUDENT SERVICE FACILITIES

DATA TO BE DETERMINED:

- Estimated assignable square feet of student service facilities

PROCEDURE:

1. Develop, select, or adopt facilities planning criteria for student service spaces which reflect the wishes of the institution.
   a. Student Union - 9.5 ASF/FTE Student
   b. Lounge and Commons - 1.5 ASF/FTE Student
2. Calculate the estimated student service facilities requirements based on the projected student enrollment.

TABLE 3.14

ESTIMATED STUDENT SERVICE FACILITIES REQUIREMENTS

Facility (1)	Students FTE (2)	Factor ASF/FTE (3)	ASF L.C. (4) = (2) x (3)
1. Student Union Facilities	2400 FTE	9.5 ASF/FTE	22,800 ASF
2. Commons and Lounge Facilities	2400 FTE	1.5 ASF/FTE	3,600 ASF
TOTAL STUDENT SERVICE FACILITIES REQUIREMENTS			26,400 ASF

STUDENT HEALTH FACILITIES

ROOM TYPES INCLUDED:

Student Health Facilities

Student Health Facilities Service

DISCUSSION:

The extent of the requirement for Student Health Facilities is determined largely by the ability of the surrounding community to provide these services. As a result, the requirement at one institution may be for nothing more than an outpatient clinic, while another institution of the same size may require a full-scale hospital.

As a result, the processes of evaluating current capacities of existing Student Health Facilities and developing the plans for new facilities have been uniquely institutional. Not yet are there any generally accepted methods for estimating future needs for these types of facilities. In all probability there will never be any either, at least as far as specific requirements are concerned.

The generalized procedures presented on the following pages are designed to aid in evaluating current capacity and in estimating future requirements for the "core" portion of the student health care facilities. They deal primarily with infirmary wards and the typical clinic facilities. The procedures do not deal with the vast array of support facilities such as dispensaries, clinical laboratories, nursing stations, etc., since the institutional individuality is more pronounced with regard to the service facilities than with the core facilities.

It is not intended that this section deal with the question of staffing ratios -- the number of doctors and subordinate staff necessary to meet the health needs of the student body. Obviously, their number is a function of the volume of student in- and outpatient demand. However, the specific value of the relationship will be left for others to define.

DISCUSSION

GENERAL PLANNING METHOD

EVALUATION OF EXISTING STUDENT HEALTH FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Current occupancy rates for existing student health facilities.

FACILITIES DATA REQUIRED:

- Number of infirmary beds currently available
- Number of examination rooms currently available

PROGRAM DATA REQUIRED:

- Historical infirmary bed occupancy rates
- Historical data on number of outpatients treated daily

JUDGMENTS REQUIRED:

- Average number of patients who can be treated in an examination room during the course of a day.

PROCEDURE:

The procedure is concerned with both inpatient and outpatient student health facilities.

A. Inpatient Student Health Facilities

1. Calculate the total patient bed day capacity of the current student health care facilities.

   Total patient bed day capacity is the product of the total number of hospital beds available at the institution and the number of operating days in the year that the facilities will be operated.

2. From the program data determine the current use of the student health facilities in terms of actual patient bed days.

   This information, which is simply a summation of the number of days occupied for all available beds at the institution, is usually a matter of record in the office of the student health facilities director.

3. Calculate the occupancy rate.

   The occupancy rate is simply the result of dividing the actual patient bed days (determined in step 2) by the total patient bed day capacity of the facilities (calculated in step 1).

4. Evaluate the occupancy rate.

   This step is subjunctive in nature and should be done in consultation with the student health facilities director.

B. Outpatient Student Health Care Facilities

1. From the facilities inventory, obtain a tabulation of the number of examination rooms which are available for outpatient services.

2. Determine the average number of patients who can be accommodated in each examination room each day.

   Admittedly, this determination is a function of the severity of the health problem involved. However, the student health facilities director should be able to indicate what the average length of each appointment is. This figure, divided into the total hours the outpatient services are available each day results in an indication of how many students can be accommodated in one examination room during the day.

3. Calculate the total daily capacity of the outpatient facilities.

   This capacity is the product of the number of available examination rooms and the average possible number of patients who can be accommodated each day in each examination room.

4. From the program data, determine the current use of outpatient facilities.

   This figure is simply average daily outpatients, which can be obtained from the director of the student health facilities.

5. Compare the current average daily use with the total daily capacity of the outpatient facilities.

COMMENTS ON THE PROCEDURE:

First, this procedure deals in averages. It is not feasible to build infirmaries designed to accommodate peak loads since this would result in a very low utilization rate a great deal of the time. In situations such as Asian flu epidemics, alternative methods of handling the loads must to be established.

Second, the procedure includes an implicit assumption that existing facilities are of a "type" appropriate to the institution (i.e., the institution has an outpatient clinic rather than a small-scale general hospital in situations in which this type of facility is appropriate).

EXAMPLE

GENERAL PLANNING METHOD

EVALUATION OF EXISTING STUDENT HEALTH FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Current occupancy rates for existing student health facilities

PROCEDURE:

A. Inpatient Student Health Facilities

1. Calculate the total patient bed day capacity of the current student health care facilities.

$$\text{Total Patient Bed Day Capacity} = \text{Total Beds Available} \times \text{Number of Operating Days in the Year}$$

$$\text{Total Patient Bed Day Capacity} = 12 \text{ Beds} \times 365 \frac{\text{days}}{\text{year}}$$

$$\text{Total Patient Bed Day Capacity} = 4380 \text{ Patient Bed Days/Year}$$

2. From the program data determine the current use of the student health facilities in terms of actual patient bed days.

$$\text{Actual Patient Bed Days} = 2060 \text{ days/year}$$

3. Calculate the occupancy rate.

$$\text{Occupancy Rate} = \frac{(\text{Actual Patient Bed Days})}{(\text{Total Patient Bed Day Capacity})}$$

$$= \frac{(2060)}{(4380)}$$

$$= 47\%$$

4. Evaluate the Occupancy Rate.

   The student health facilities director feels that the current occupancy rate is satisfactory because rates much in excess of 60% given the circumstances of this particular institution would be prohibitive.

B. Outpatient Student Health Care Facilities

1. From the facilities inventory obtain a tabulation of the number of examination rooms which are available for outpatient services.

   a. two examination rooms devoted primarily to outpatient services.

   b. one overflow room generally used as a nurses office is also available and is frequently used for minor health problems and injuries.

2. Determine the average number of patients who can be accommodated in each examination room each day.

   Records indicate that the average appointment-duration is about 40 minutes and that the length of the normal operating day is 8 hours. Therefore, on the average, 12 outpatients can be served in each examination room each day.

3. Calculate the total daily capacity of the outpatient facilities.

$$\text{Total Daily Capacity} = \text{Number of Examination Rooms} \times \text{Average Possible Number of Patients Daily}$$

$$= 3 \text{ Rooms} \times 12 \text{ patients}$$

$$= 36 \text{ patients (capacity)}$$

4. From program data, determine the current use of outpatient facilities.

   Records indicate that the average number of outpatients per day has been 11 for the past two years.

5. Compare the current average daily use with the total daily capacity of the outpatient facilities.

   The current use is less than one-third of the capacity and appears to be acceptable for the present.

DISCUSSION

GENERAL PLANNING METHOD

PROJECTION OF STUDENT HEALTH FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Number of infirmary beds and/or examination rooms required in the target year

PROGRAM DATA REQUIRED:

- Projected number of students in the target year (who are eligible for medical care).

JUDGMENTS REQUIRED:

- Average incidence of persons requiring inpatient health services per 1000 population.
- Average length of confinement per patient.
- Optimum percentage of beds occupied.
- Average number of persons who can be treated in an examination room in one day.
- Average incidence of persons requiring outpatient care each day.

PROCEDURE:

A. Inpatient Student Health Facilities

1. From the program data, determine the number of persons who will be eligible for health care services.
2. Estimate the average incidence of persons requiring inpatient health services per 1000 population.

   The average incidence of inpatient service requirements is usually a matter of institutional record. If this information is lacking, however, it may be obtained from similar institutions.
3. Estimate the average length of confinement per patient.

   This also should be a matter of institutional record.

4. Estimate the optimum percentage of beds occupied.

   This estimate should be made in consultation with the director of the campus student health facilities.

5. Calculate the total necessary patient bed days.

   Total patient bed days may be calculated with the use of the following formula:

$$\text{Total Patient Bed Day Capacity} = \frac{(\text{Population}) \times (\text{Incidence}) \times (\text{Average Length of Confinement}}{(\text{Optimum Percentage of Beds Occupied})}$$

6. Determine the minimum number of beds necessary to accommodate the calculated patient bed day load.

$$\text{Number of Beds} = \frac{\text{Necessary Patient Bed Days}}{\text{Number of Days per Year}}$$

B. Outpatient Student Health Facilities

1. Estimate the average incidence of persons requiring outpatient health services per day.

   This figure may be determined on the basis of historical data.

2. Estimate the average number of persons who can be treated in an examination room in one day.

3. Calculate the number of examination rooms required.

   This is the result of dividing the number of persons estimated to require outpatient care per day by the average number of persons who can be accommodated in one examination room during the course of one day.

COMMENTS ON THE PROCEDURE:

As indicated in the discussion which is introductory to this section, a major portion of student health care facilities -- the service space -- is not covered by this procedure. The requirements for such space must be determined by the staff directly involved in the use of such facilities.

These procedures may be interpreted to be appropriate for requirements for the rapidly expanding mental-health care programs. Requirements are determined on the same basis as requirements for outpatient medical care facilities.

EXAMPLE

GENERAL PLANNING METHOD

PROJECTION OF STUDENT HEALTH FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Number of infirmary beds and/or examination rooms required in the target year.

PROCEDURE:

A. Inpatient Student Health Facilities

1. From the program data, determine the number of persons who will be eligible for health care services.

   All students and staff will be eligible for health service

   Therefore:

a. Students	2400
b. Staff	301
Total	2701 persons

2. Estimate the average incidence of persons requiring inpatient health services per 1000 population.

   Institutional records indicate that, on the average, 87 persons out of every 1000 at the institution have required inpatient health services each year.

3. Estimate the average length of confinement per patient.

   Institutional records indicate the average length of confinement per patient has been 3.4 days.

4. Estimate the optimum percentage of beds occupied.

   The health facilities director feels that the optimum percentage of beds occupied should be about 55%.

5. Calculate the total necessary patient bed day capacity.

$$\text{Total Patient Bed Day Capacity} = \frac{(\text{Population}) \times (\text{Incidence}) \times (\text{Average Length of Confinement}}{(\text{Optimum Percentage of Beds Occupied})}$$

$$= \frac{(2701 \text{ persons}) \times (\frac{87}{1000}) \times (3.4 \text{ days})}{55\%}$$

= 1453 necessary patient bed days per year.

6. Determine the minimum number of beds necessary to accommodate the calculated patient bed day load.

$$\text{Number of Beds} = \frac{\text{Necessary patient Bed Days Per Year}}{\text{Number of Days per year}}$$

$$= \frac{1453}{365}$$

$$= 4 \text{ beds}$$

B. Outpatient Student Health Facilities

1. Estimate the average incidence of persons requiring outpatient health services per day.

   In the past, 11 persons per day on the average have been served by the outpatient facilities. It will be assumed that the same proportion will hold at the 2400 student level.

Therefore:

$$\text{Estimated Persons} = \frac{\text{(Projected Population)}}{\text{(Current Population)}} \times \text{(Current Outpatient)}$$

$$= \frac{\text{(2701 students \& staff)}}{(1822)} \times (11)$$

$$= 17 \text{ Outpatients}$$

2. Estimate the average number of persons who can be treated in an examination room in one day.

   It is estimated that, on the average, 10 persons can be treated each day in one examination room.

3. Calculate the number of examination rooms required.

$$\text{Number of Examination Rooms} = \frac{\text{(Estimated Outpatients per day)}}{\text{(Outpatients per Examination Room per day)}}$$

$$= \frac{\text{(17 persons/day)}}{\text{(10 persons/room per day)}}$$

$$= 1.7 \text{ rooms}$$

or

$$\approx 2 \text{ examination rooms}$$

UNIT FLOOR AREA CRITERIA

Room Type: General Use Facilities
Residential Facilities

Room Type Codes: 630 Food Facilities
635 Food Facilities Service

650 Lounge Facilities
655 Lounge Facilities Service

670 Recreation Facilities
675 Recreation Facilities Service

910 Residence for Single Persons

911 Dormitory

912 Food Service in Residence Halls

920 One-Family Dwelling

930 Multiple Family Dwelling

Food Facilities design criteria tabulated by:

- Area per dining station.

Lounge and Recreation design criteria tabulated by:

- Activities.

Residential Facilities design criteria tabulated by:

- Type of occupancy.

DISCUSSION:

Unit floor area criteria for these types of facilities are not as common as they could be. There are, however, many planning standards (See Manual Six, Section 5.0) for these same facilities. The unit floor area criteria listed on the following page are not intended to be comprehensive, primarily because of the latitude needed to account for individual institutional prerogatives in such cases. Table 3.15 lists the criteria suggested for these facilities.

DESIGN CRITERIA:

TABLE 3.15

GENERAL USE FACILITIES UNIT AREA DESIGN CRITERIA

TYPE OF FACILITY	ITEM	ASSIGNABLE SQUARE FEET
1. Food Facilities	1. Dining Station-Family Size	12.5
	2. Dining Station-Cafeteria	11.0
	3. Dining Station-Snack Bar	10.0
2. Lounge Facilities	1. Station-Commons Room	20
3. Recreation Facilities	1. Lockers	6.75
	2. Meeting Room	20 ASF/STATION
	3. Barber Shop	100 ASF/CHAIR
	4. Billards	320 ASF/TABLE
	5. Bowling Alley	575 ASF/LANE
	6. Kitchenette	20
	7. Table Tennis	345 ASF/TABLE
4. Residential Facilities	1. Single Occupancy*	110 - 130
	2. Double Occupancy*	190 - 230
	3. Married - One Bedroom	570 - 650
	4. Married - Two Bedroom	620 - 750

*Toilets, washrooms, showers, and recreational space are not included.

ATHLETIC - PHYSICAL EDUCATION FACILITIES

ROOM TYPE INCLUDED

Gymnasiums, ice rinks, basketball courts, handball courts, wrestling rooms, swimming pools, indoor tracks, fieldhouses, and the associated spectator seating and service areas.

DISCUSSION

The evaluation and projection of athletic-physical education facilities is a complex problem reflecting many circumstances: institutional philosophy, educational programs, level and sex of students, climatic conditions, urban vs. rural location, source and amount of capital funding and so on. The net effect of these circumstances has been few or no such facilities at some institutions to extensive athletic facilities at other institutions; from only recreational facilities to the full range of physical education, intercollegiate, intramural, recreational, and other activities.

Many types of space are classified as athletic-physical education facilities. In most cases, the athletic-physical education activities are so specialized that each type requires a very restricted type of space. The swimming pool is used for swimming and water polo; the handball courts for handball and squash; the ice rink for skating and hockey. Even the least specialized type of athletic facility is used for only a very few different types of activities. As a result, the detailed procedures for evaluating current capacity of physical education facilities and for projecting future needs of such facilities must be designed to deal with each specific type of space individually. Evaluation of the capacity of all physical education space as a single entity may yield such a generalized answer as to be misleading.

Estimation of future requirements for physical education facilities is based on projection of the level of activity within each of the programs served by these facilities:

1) Physical education classes - formally organized and scheduled instructional activities;

2) Intercollegiate athletics;

3) Intramural athletics - formally organized recreational activities; and

4) Free-time recreational activities which are unscheduled and not formally organized.

The planning process for these facilities may be relatively simple or complex, depending upon the variety of program served.

In addition to these physical education-oriented activities which occur in the facilities, other activities often place additional demands upon them.

In particular, a gymnasium or field house is often forced to double as an auditorium for purposes of providing entertainment activities. They may also be used for course registration, administering final exams, and a myriad of other activities which require large floor areas and/or seating capacity.

Not only are there a wide variety of uses for physical education facilities, but the level of activity shows a high degree of seasonal variation. When weather conditions are appropriate for outdoor activities, it is common for all programs to place a substantially reduced load on physical education facilities. Inclement weather plus the effect of year-round climate (California vs. New York) normally generates a consistently greater need by all programs. As a result, it is necessary to evaluate current use and project future requirements on the basis of the combined peak loads of all programs.

As a final comment, it must be noted that the sex of participants places further limitations on the flexibility of use of physical education facilities. In most instances, it is necessary to either schedule the use by men separately from that by women or to provide completely separate facilities.

In the following pages, two different methods for evaluating the current use and for projecting future needs of physical education facilities are presented. First, a set of detailed procedures designed to evaluate and project the use of each of the various types of physical education space are discussed. Second, general planning methods designed only to indicate general sufficiency of current space or to estimate total future needs are presented.

DISCUSSION

DETAILED METHOD

EVALUATION OF EXISTING PHYSICAL EDUCATION FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Hours per week each type of facility is available to meet the requirements of each of the different programs which require the use of that type of facility.
- Number of individuals that can be accomodated each period by type of facility and by program.

PROGRAM DATA REQUIRED:

- Current number of hours per week of formally organized activities scheduled in each of the different types of space.

FACILITIES DATA REQUIRED:

- Number of available rooms or "units" of each of the different types of physical education facilities. For example, the respective numbers of handball courts basketball floors, general exercise rooms, indoor tracks, etc.

  Capacity of these facilities is more often determined by the rules of the game than by the floor area of the facilities. As a result, the most important facilities data is number of rooms rather than their areas.

UTILIZATION ASSUMPTIONS REQUIRED:

For each type of physical education facility:

- A room utilization rate (i.e., hours per week of use)
- An expected number of stations (participants) per room.

It should be noted that the expected number of stations (participants) per room can vary depending on the program using that room. For example, when the basketball court is used for intercollegiate athletics, the maximum number of users may be 20 or 25; when it is used for intramurals and physical education instruction the number of users may be 40; and when used for free-time activities, the maximum number of users may be as high as 50 or 60. These variations must be recognized when number of stations are determined for each room.

PROCEDURE:

1) Obtain from the facilities inventory, a listing of the available physical education facilities.

It should be noted that not all athletic-physical education facilities are included--e.g., outdoor tennis courts, track, football practice fields, baseball fields, soccer fields, golf courses, lakes, mountains, arboretums, etc.

2) Establish, as a matter of institutional policy, a room utilization rate for each room (number of hours of use per week).

The room-utilization rate may well vary drastically from room to room. For example, facilities for which the presence of an attendant is required (such as a swimming pool) may be available fewer hours per week than a facility for which an attendant is not required (such as a handball court).

3) Determine the number of persons who can use each room at one time, by program.

Programs in this case are for the escapee, for physical education classes, for intercollegiate athletics, etc. The determination in this step is not particularly relevant for intercollegiate athletics since the number of participants is determined on the basis of different considerations (i.e., how many individuals "make the team"). For all other programs, this determination is very important.

4) Determine the number of hours per week that each room is currently set aside for the exclusive use of each of the programs.

At most institutions, the allocation of time to the various programs is quite rigid and is usually accomplished on a priority basis. In particular, one approach might be to first set aside specific hours for use for physical education instruction and for intercollegiate athletics. Next, the schedule for intramural activities would be accommodated. The residual is then devoted to free-time recreational activities.

Again, there may be different patterns of use for different types of space (e.g., the intercollegiate athletics program places a much smaller demand on handball courts than on the basketball courts). It should also be noted that the use patterns vary seasonally. As a result, the determination of number of hours of use per week for each of the different rooms must be based on a period of peak use (normally the use patterns prevailing in the winter months) provided these peaks are necessary and cannot be spared over time.

5) Determine the number of weekly student-hours (weekly user-hours) hours) for each program which can be accommodated by each type of space (each room).

For intercollegiate athletics, this measure is usually of little significance since the number of users is determined by other considerations (e.g., how many "make the team"). For the other programs, however, the maximum number of weekly user-hours is a significant measure and is calculated by multiplying the number of hours per week the room is available for use by each program by the number of individuals in each program that can be accommodated at one time.

EXAMPLE

DETAILED METHOD

EVALUATION OF EXISTING PHYSICAL EDUCATION FACILITIES CAPACITY

DATA TO BE DETERMINED:

- Hours per week that each type of facility is available to meet the requirements of each of the different programs which require the use of that type of facility.

- Number of individuals that can be accommodated each period by type of facility and by program.

PROCEDURE:

1. Obtain from the facilities inventory, a listing of the available physical education facilities.

TABLE 4.1

INVENTORY OF PHYSICAL EDUCATION FACILITIES

FACILITY	UNITS AVAILABLE
1. Intercollegiate Basketball Arena	1 Court
2. Mens Gym - Basketball	1 Court - 6 Baskets
3. Mens Gym - Handball, Paddleball, Squash	6 Courts
4. Swimming Pool	1 Pool - 6 Lanes
5. Womens Gym - Basketball	1 Court - 6 Baskets
6. Exercise Room	8 Stations

2. Establish, as a matter of institutional policy, a room utilization rate for each room.

TABLE 4.2

ROOM UTILIZATION RATE FOR PHYSICAL EDUCATION ROOMS

Facility	Hours of Use Per Week
1. Intercollegiate Basketball Arena	15 Hrs./Week
2. Men's Gym - Basketball	55 Hrs./Week
3. Men's Gym - Handball, Paddleball, Squash	55 Hrs./Week
4. Swimming Pool	55 Hrs./Week
5. Women's Gym - Basketball	45 Hrs./Week
6. Women's Gym - Exercise Room	45 Hrs./Week

3. Determine the number of persons who can use each room at one time by program.

TABLE 4.3

NUMBER OF PERSONS WHO CAN USE EACH ROOM BY PROGRAM

Facility	Number of Persons Who Can Use at One Time	
	Instruction	Recreation
1. Intercollegiate Basketball	2 Teams	--
2. Men's Gym - Basketball	40	60
3. Men's Gym - Handball, Paddleball, Squash	12 Singles 24 Doubles	12 Singles 24 Doubles
4. Swimming	18	50
5. Women's Gym - Basketball	72	72
6. Women's Gym - Exercise Room	16	20

4. Determine the of hours per week that each room is currently set aside for the exclusive use of each of the programs.

TABLE 4.4

RESERVED HOURS PER WEEK FOR PHYSICAL EDUCATION PROGRAMS

Facility	Reserved Hours Per Week	
	Instruction	Recreation
1. Intercollegiate Basketball Arena	15	--
2. Men's Gym - Basketball	20	20
3. Men's Gym - Handball, Paddleball, Squash	20	20
4. Swimming Pool	16	10
5. Women's Gym - Basketball	20	20
6. Women's Gym - Exercise Room	20	24

5. Determine the number of weekly-student hours (weekly-user hours) for each program which can be accommodated by each type of space (each room).

TABLE 4.5

NUMBER OF WEEKLY-STUDENT HOURS WHICH CAN BE ACCOMMODATED

	Instruction			Recreation		
Facility	Number of Persons at One Time	Reserved Hours Per Week	Weekly Student Hours	Number of Persons at One Time	Reserved Hours Per Week	Weekly User Hours
1. Intercollegiate Basketball	2 Teams	15	(NA)			
2. Men's Gym - Basketball	40	20	800	60	20	1200
3. Men's Gym - Handball, Paddleball, Squash						
Singles	12	20	240	12	20	240
Doubles	24	20	480	24	20	480
4. Swimming Pool	18	16	288	50	10	500
5. Women's Gym - Basketball	72	20	1440	72	20	1440
6. Exercise Room	16	20	320	20	24	480

DISCUSSION

DETAILED METHOD

PROJECTION OF PHYSICAL EDUCATION FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Additional "units" of each type of physical education space (other than outdoor facilities) required.

PROGRAM DATA REQUIRED:

- Projected weekly room-hours and weekly student-hours of formally organized physical education instructional activities by type of space required. The basic data for this projection are projections of enrollments in physical education courses.
- Projected weekly room-hours for each type of physical education space required to meet the needs of the intercollegiate athletic program.
- Projected weekly room-hours and weekly user-hours of intramural activities by type of space required. This projection requires estimating the number of individuals who will be engaged in each of the intramural activities.
- Head-count students

FACILITIES DATA REQUIRED:

- Number of available rooms or units of each of the different types of physical education facilities (other than outdoor facilities).

UTILIZATION DATA REQUIRED:

For each type of physical education facility:

- A room utilization rate (i.e., hours of use per week)
- Number of individuals who can be accommodated at one time (will vary by program for many types of space).

PROCEDURE:

In general, the procedures for determining requirements for physical education facilities are as follows:

1) Determine the number of hours per week each facility must be reserved for use by those programs which have formally organized activities (usually all programs except the free-time recreational activities).

2) Compare this requirement with the available number of weekly room-hours for each type of facility.

3) Make a judgment concerning the sufficiency of the remaining weekly room-hours to satisfy the requirements for free-time recreational activities.

4) Determine the additional requirements for each type of physical education space.

The emphasis in this procedure is on type of facility and the hours per week that the facilities are required for activities associated with each of the various programs.

The specific steps of the procedure for estimating future requirements for physical education facilities are presented below:

1) Obtain a listing of all the physical education facilities currently available and the number of hours per week that each is available.

   Any type of space which is not currently available within any of the programs should be added to this list.

2) Calculate (estimate) the total number of hours per week that each type of space must be made available for use by those programs which have formally-organized activities.

   The procedures for determining number of weekly room-hours required varies from program to program.

   a) Intercollegiate Athletics

      At most institutions certain of the physical education facilities are set aside for the exclusive use of the intercollegiate athletic program during a specific period each day (e.g., 3-7 p.m.). As a result, the number of weekly room-hours of each type of physical education space devoted to intercollegiate athletics is determined by an administrative decision and is not calculated on the basis of projected program data.

   b) Physical Education Instruction Program

      There are two procedures commonly used to determine the number of weekly room-hours of each of the different types of physical education space required for the activities of the physical education instruction program.

First, since these facilities can be considered as laboratories for the physical education instructional program, procedures similar to those used in determining requirements for class laboratories are appropriate.

In summary, these procedures require that:

1) Enrollments in physical education courses be projected for the planning year;

2) These course enrollments be converted to weekly student-hours by activities requiring each of the various types of space.

3) The weekly student-hours of instruction in each type of space be divided by the number of persons who can be accommodated at any one time. This yields the number of required weekly room-hours for each type of space.

Second, a particular bloc of time (e.g., 8:00 a.m. - 3:00 p.m. each day) can be set aside for the exclusive use of the physical education instructional program. This approach requires that a simple analysis be performed to determine whether the projected number of weekly student-hours in physical education courses can be accommodated within the time allotted.

c) Intramural Athletics

Again, the weekly room-hours of each type of facility can be determined either on the basis of an administrative decision which serves to allot a particular bloc of time to this program or on the basis of a calculation much like that for the physical education instructional program. This calculation requires a projection of the number of weekly user-hours of activity in each particular type of facility. [Such a projection could take the form of an assumption that there would be 20 teams participating in basketball and that these teams would play a game a week (10 games) with each game lasting approximately 90 minutes. The result is a requirement of 15 hours of use per week of a basketball court.]

By adding the requirements of these three programs, a total weekly room-hour load for each type of facility is obtained.

3. Calculate the number of weekly room-hours for each program for each type of facility currently available.

This calculation is accomplished by multiplying the number of units of each type of facility available (from the inventory) by the number of hours per week that facility is to be open (the room-utilization rate -- a utilization assumption).

4. Compare the weekly room-hours of each type of facility required with the weekly room-hours available for that type.

5. Calculate the number of weekly-hours of free time recreational activities which can be accommodated.

   When the requirements of the formally-organized activities exceed the available facilities, no free-time recreational activities can be accommodated. Where the weekly room-hours available exceed the requirements of the formally-organized activities, the number of weekly user-hours available for recreational activities can be calculated by multiplying the number of hours remaining by the number of individuals that can be accommodated at one time.

6. Judge the requirements for additional facilities of each type.

   Having gone through the previous steps, two types of information are available:

   a) The number of additional weekly room-hours required to meet the needs of the formally-organized activities by type of facility, or

   b) The number of weekly user-hours of recreation activities which can be accommodated in each type of space in which the formally-organized activities do not require all available hours.

   On the basis of this information, the decision-maker must determine the additional number of units of each type of space which must be provided to satisfy the requirements of all programs. This means that the need of the formally-organized activities must be met and an "acceptable" number of weekly user-hours of recreational activities accommodated. Only the judgment of a knowledgeable individual can determine what is "acceptable" on any given campus.

COMMENTS ON THE PROCEDURE:

Determining the additional requirements for each type of physical education space by no means assumes that these facilities can be provided feasibly. Physical education facilities, of necessity, are constructed in large increments. As a result, if the additional requirements are not sufficiently extensive to warrant construction of a major new facility, the institution will probably have to do without. In such a situation, it is necessary to revise the programs which have combined to place excessive demands upon certain of the physical education facilities. These revisions can take a variety of forms. For example, any or all programs can be cut back or different space management techniques can be employed. Urban institutions may rent space or depend upon the community to supply facilities at a price. With respect to the latter possibility, such steps as abandoning a policy of allotting specific time blocks to each program and obtaining greater flexibility in scheduling and the use of the space.

It should be indicated that this procedure represents just about the only procedure available for projecting requirements for physical education facilities with any degree of accuracy. Many institutions and agencies have used an "assignable square feet per FTE student" or an "assignable square feet per weekly student-hour of physical education instruction" factor as the basis for projecting the requirements for physical education facilities. However, such measures are extremely insensitive to many of the important determinants of the types of facilities required. In reality, physical education facilities are extremely heterogeneous. Any projection techniques which do not recognize these differences can produce very misleading results. Projecting requirements for all physical education facilities on the basis of a single factor is analogous to projecting the class laboratory facilities requirements for all academic departments on the basis of a single factor. The factor based on weekly student-hours is especially insensitive since it not only uses a single figure for all types of space, but deals with only one of the many programs which use such facilities. As a result of these considerations mentioned above, no other procedures will be presented in these manuals.

EXAMPLE
DETAILED METHOD
PROJECTION OF PHYSICAL EDUCATION FACILITIES REQUIREMENTS

DATA TO BE DETERMINED:

- Additional "units" of each type of physical education space (other than outdoor facilities) required.

PROCEDURE:

1. Obtain a listing of all the physical education facilities currently available and the number of hours per week that each is available.

TABLE 4.6

INVENTORY OF PHYSICAL EDUCATION FACILITIES

Facility	Number of Units Available	Hours per Week Available
1. Intercollegiate Basketball Arena	1 Court	15
2. Men's Gym - Basketball Court	1 Court - 6 Baskets	55
3. Men's Gym - Handball, Paddleball, Squash	6 Courts	55 Each
4. Swimming Pool	1 Pool - 6 Lanes	55
5. Women's Gym - Basketball Court	1 Court - 6 Baskets	45
6. Women's Gym - Exercise Room	8 Stations	45

2. Calculate (estimate) the total number of hours per week that each type of space must be made available for use by those programs which have formally organized activities.

TABLE 4.7

TOTAL NUMBER OF HOURS PER WEEK THAT EACH TYPE OF SPACE MUST BE MADE AVAILABLE FOR PROGRAMS

Facility	Necessary Hours Per Week		
	Instruction	Intramural	Recreation
1. Intercollegiate Basketball Arena	20	6	--
2. Men's Gym - Basketball	20	12	25
3. Men's Gym - Handball, Paddleball, Squash	20	12	25
4. Swimming Pool	18	6	8
5. Women's Gym - Basketball	20	10	20
6. Women's Gym - Exercise Room	20	--	24
7. Additional Projected Programs			
a. Men's Wrestling, Tumbling, Exercise	20	8	25
b. Women's Swimming	12	4	8

3. Calculate the number of weekly room-hours for each program for each type of facility currently available.

TABLE 4.8

NUMBER OF WEEKLY ROOM HOURS FOR EACH PROGRAM

FACILITY	INSTRUCTION			INTRAMURALS			RECREATION		
	UNITS	HOURS	WRH	UNITS	HOURS	WRH	UNITS	HOURS	WRH
1. Intercol. Basketball	1	20	20	1	6	6	--	--	--
2. Men's Gym. - Basketball	1	20	20	1	12	12	1	25	25
3. Handball, Paddleball, Squash	6	20	120	6	12	72	6	25	150
4. Swimming Pool	1	18	18	1	6	6	1	8	8
Men's Subtotal	8	58	158	8	30	90	8	58	183
1. Women's Gym - Basketball	1	20	20	1	10	10	1	20	20
2. Women's Gym - Exercise Room	1	20	20	--	--	--	1	24	24
Women's Subtotal	2	40	40	1	10	10	2	44	44
Additional									
1. Women's Swimming Pool	1	12	12	1	4	4	1	8	8
2. Men's Wrestling	1	20	20	1	8	8	1	25	25
Additional Subtotal	2	32	32	2	12	12	2	33	33
Total - All	13	150	250	13	58	118	12	135	260

4. Compare the weekly room-hours of each type of facility required with the weekly room hours available.

TABLE 4.9

COMPARISON OF AVAILABLE* AND REQUIRED

WEEKLY ROOM-HOURS

FACILITY	WEEKLY ROOM-HOURS REQUIRED				WRH
	INSTITUTION (1)	INTRAMURAL (2)	RECREATION (3)	TOTAL (1)+(2)+(3)=4	AVAILABLE (5)
1. Intercol. Basketball	20	6		26	15
2. Men's Gym - Basketball	20	12	25	57	55
3. Men's Gym - Handball, Paddleball, Squash	120	72	150	342	330
4. Swimming Pool	18	6	8	32	55
Subtotal	158	90	183	431	440
5. Women's Gym - Basketball	20	10	20	50	45
6. Women's Gym - Exercise Room	20	--	24	44	45
Subtotal	40	10	44	94	90
7. Additional - Women's Swimming	12	4	8	24	--
8. Additional - Wrestling, Tumbling, Exercise	20	8	25	53	--
Subtotal	32	12	33	77	0
Total	250	118	260	628	545

*Available weekly room-hours from Table 4.5.

5. Calculate the number of weekly-hours of free time recreational activities which can be accommodated.

TABLE 4.10

ADDITIONAL WEEKLY-HOURS WHICH CAN BE ACCOMMODATED

FACILITY	TOTAL HOURS REQUIRED (1)	TOTAL HOURS AVAILABLE (2)	ADDITIONAL HOURS (2)-(1)=3
1. Intercollegiate Basketball	26	15	-11
2. Men's Gym - Basketball	57	55	-2
3. Men's Gym - Handball, Paddleball, Squash	342	330	-12
4. Swimming Pool	32	55	23
5. Women's Gym - Basketball	50	45	-5
6. Women's Gym - Exercise Room	44	45	1
7. Women's Swimming	24	--	-24
8. Men's Wrestling, Tumbling and Exercise	53	--	-53

6. Judge the requirement for additional facilities of each type.

   a. Making the Intercollegiate Basketball Area available more hours per day will absorb the additional 11 hours required. The same holds for men's basketball, handball, and women's basketball and exercise room.

   b. Women's swimming can be scheduled in the present swimming pool.

   c. There is a need for a men's tumbling, wrestling and exercise room. However, unless it can be accommodated in some convenient and proximate space, it is generally not wise to construct Physical Education space in so small an increment.

UNIT FLOOR AREA CRITERIA

ROOM TYPE: Special-Use Facilities

ROOM TYPE CODES:
520 Athletic-Physical Education Facilities
523 Athletic Facilities Spectator Seating
525 Athletic-Physical Education Facilities Service

Design criteria tabulated by:

- Type of Athletic Activity

DISUCSSION:

Table 4.11 displays a tabulation of Athletic-Physical Education space design criteria. Of all design criteria, perhaps these are most easy to compile and list since the space required for the competitive activity usually is determined by the rules of the game. Of course the problem arises when circulation and buffer space considerations are to be made. The Table includes allowances for these. Nevertheless, it should be noted that there is room for variation in the factors listed.

DESIGN CRITERIA:

TABLE 4.11

ATHLETIC-PHYSICAL EDUCATION SPACE UNIT AREA CRITIERA

Athletic Activities Station or Component[a]	Assignable Square Feet
1	2
1. Basketball courts:	
2. Practice court	4370
3. Competition court	6240
4. Combination of 2 practice courts & 1 competition court	8735
5. Baseball diamond (infield for fieldhouse)	16900
6. Football cage (fieldhouse)	19260
7. Indoor track: 1/4 mile, 6 lanes	33000
8. Handball: 4-wall court	1060
9. Handball: 1-wall court	680
10. Squash: doubles court	1125
11. Squash: singles court	595
12. Shuffleboard	625
13. Volleyball (per court)	3025
14. Wrestling (per mat)	1155
15. Boxing:	
16. Ring (1)	900
17. Punching bag (per bag)	15
18. Punching bag, Heavy (per bag)	35
19. Pool (olympic standards - 6 lanes)	7130
20. Exercise room (per person)	50
21. Rifle range (per point or firing position)	400
22. Pistol range (per point or firing position)	320
23. Fencing (per strip)	325
24. Spectator seating, foldable (per seat)	2.5
25. Lockers (per locker):	
26. Varsity rooms	10
27. General locker room	6.75
28. Tote basket	.50
29. Showers (per head, gang showers)	16
30. Shower-dressing staff for women (per unit)	24
31. Ticket booth	25
32. First aid, training, physical therapy room	750

---

[a] With the exception of self-contained facilities (e.g., handball and squash courts), the criteria all include allowances for buffer zones or circulation space around actual playing or competition area. Clearly, there is room for variation from these figures since (a) competition areas need not be regulation-size, and (b) two or more units may be combined, with resulting savings in circulation space needs.

DISCUSSION
GENERAL PLANNING METHOD
SUPPORTING FACILITIES

ROOM TYPES INCLUDED:

Shop facilities, shop facilities service, storage facilities, storage facilities service, vehicle storage, vehicle storage service.

DISCUSSION:

These supporting facilities are designed primarily to fulfill and house the operational and maintenance requirements of an institution's plant. Their existence is dependent upon many factors, among which are operational style, size, and location of the institution. Economics of scale allow larger institutions to retain complete automotive servicing facilities for their institutional fleet of cars, a full time staff of carpenters, plumbers and electricians to take care of repair and minor remodeling tasks, and large, skilled machine shop staffs. In contrast is the small institution which cannot afford nor allow itself the expense of such a broad support staff. These factors all tend to play a role in the amount of such space necessary to take care of the custodial, maintenance and repair, and security needs of an institution.

To describe detailed projection techniques for these types of supporting space would be misleading because of the unique factors and circumstances which come into play at each institution. Only a very general planning method will be suggested here which will indicate to the planner what the overall needs for these types of facilities are. Circumstances at each institution will determine the specific needs.

DATA TO BE DETERMINED:

- Assignable square feet of supporting facilities

FACILITIES DATA REQUIRED:

- Assignable square feet of all types of space to be maintained by the institution.

JUDGMENTS REQUIRED:

- Percentage of the total assignable square feet to be maintained by the institution.

PROCEDURE:

1. Summarize the projection of assignable square feet required for all types of space to be maintained by the institution.

   At many institutions, separate staffs are employed for the purposes of maintaining dormitory, dining, and other auxiliary enterprise facilities thus reducing the amount of space to be maintained by institutional staff.

2. Determine a percentage of the total assignable square feet to be maintained by the institution.

   This percentage, multiplied by the total assignable square feet to be maintained by the institution, will yield the amount of space necessary to support these maintenance and service activities. If offices have been included in another projective technique, then the percentage will be lower than if they were not. The percentage also should reflect, as stated previously, the extent of services and maintenance operations. Section 5.9 of Manual Six lists some suggested ranges for this percentage.

3. Calculate the assignable square feet of maintenance and service areas.

   This figure is the mathematical product of the percentage determined in Step 2 and the assignable square feet determined in Step 1.

EXAMPLE

GENERAL PLANNING METHOD

DATA TO BE DETERMINED:

- Assignable square feet of service facilities

PROCEDURE:

1. Summarize the projected assignable square feet required for all types of space to be maintained by the institution.

   Total Assignable Square Feet = 432,060 ASF

2. Determine a percentage of the total assignable square feet to be maintained by the institution.

   Since offices have been included in another technique and the primary needs are for warehouse and shop space, 3.5% seems sufficient.

3. Calculate the assignable square feet of maintenance and service areas.

   Assignable Square Feet = (Percentage) X (Total ASF)

   = (3.5%) X (432,060)

   = 15,120 Assignable Square Feet

FOUNDATIONS OF FACILITIES PLANNING AND MANAGEMENT

MANUAL SIX

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INTRODUCTION:

Manual Six deals with those topics which are closely related to facilities planning, but which are not, per se, part of the institutional facilities planning process.

Sections 2.0, 3.0, and 4.0 taken together, describe the program planning and analysis procedures which, ideally, should precede the facilities planning activities discussed in Manuals Two through Five.

Because these manuals are meant to deal primarily with the specifics rather than all aspects of facilities planning, the discussion of these subjects has been located subsequent to those which deal with methodologies. The particular organization of this section, however, is in no way intended to play down the prime importance of the program planning activities.

Section 5.0 contains a proposed system of general planning criteria for application at the state- and system-wide levels. Although the material presented in the previous manuals has been directed to the institutional level, the needs of the individual planner responsible for evaluating the results of institutional planning efforts also have been recognized. Section 5.0 is addressed directly to their needs.

Section 6.0 represents an attempt to synthesize the material presented in all other sections of the manuals and to place this material in its proper context. The master planning process is described with the objective of insuring that the place of facilities within the total planning process is understood by the reader. In addition, Section 6.0 includes a discussion of those activities such as building programming and space management which arise from actions taken during the implementation phase of the planning process.

PROGRAM PLANNING & ANALYSIS

The process of projecting any future resource requirement of an institution of higher education begins with some notion of what the institution is and of what it can and should be in the future. The policy makers of an existing institution build from the base of what is. The planners of a new institution must build toward what they visualize that institution as becoming.

Planning for the future development of an institution must be organized around images of its potential in juxtaposition with existing institutional patterns. For an existing institution, this pattern is the institution's own history. In contrast, a new institution is planned on the basis of some chosen model, either an existing institution or some idealized concept of a potential type of institution. In either case, projecting future resource needs for an institution of higher education requires an ability to analyze the current state, whether of an existing institution or of a model chosen for the purpose, and to recommend alterations to this state in response to future objectives and constraints.

The processes of planning for the future and of analyzing the present go hand-in-hand. Without the capacity to analyze some existing model there is no foundation upon which to base projections of the future. Similarly, without the intent to use the results of analysis in the course of planning for the future, there is little justification for expending the time and energy required by the analytic activities.

Since the analysis of what does exist is so thoroughly intertwined with the planning of what will exist in the future, there is every reason to develop an analytic capability in a manner that meets directly the requirements of the planning activities. Such analyses are, in turn, dependent upon the availability of certain kinds of data. Without the required information on students, facilities, courses, staff and teaching loads, these basic analyses cannot be accomplished.

Sections 2, 3, and 4 of this manual are devoted to presentation of:

1) Program planning methodologies which provide the information basic to facilities planning,

2) Analytic techniques which support these program planning methodologies,

3) A summary of the data required by these analyses.

PROGRAM PLANNING

Program planning for institutions of higher education is a continuing series of planning processes which are interrelated but which must be approached separately and molded into the total plan as a final step. The various pieces of the program planning process which must be combined ultimately are determined by the particular data requirements of the facilities planning procedures.

It is useful to organize a discussion of the program planning processes around four primary categories of facilities. These facilities categories and the associated elements of the program planning process are as follows:

1) Academic Facilities (Instruction, Research, Public Service)
    a) Projection of instructional loads
    b) Projection of faculty and support staff in academic departments
2) Academic Support Facilities (Library, Audio-Visual, etc.)
3) Institutional Support Facilities (Administrative)
    a) Projection of support employees in non-academic departments
4) Auxiliary Enterprise Facilities (Residential, Dining, Student Health)
    a) Projection of numbers of students to be served in these facilities.

The program planning methodologies relevant to each step are described on the following pages.

DISCUSSION
PROGRAM PLANNING
DETAILED PROJECTION OF INSTRUCTIONAL LOADS

DATA TO BE DETERMINED:

- Classroom weekly room-hours (WRH), by size of section;
- Classroom weekly student-hours (WSH), by size of section;
- Total projected classroom weekly room-hours (WRH);
- Total projected classroom weekly student-hours (WSH);
- Class laboratory weekly room-hours (WRH), by size of section, for each academic specialty;
- Class laboratory weekly student-hours (WSH), by size of section, for each academic specialty;
- Total projected class-laboratory weekly room-hours (WRH) for each academic specialty;
- Total projected class-laboratory weekly student-hours (WSH) for each academic specialty; and
- Student credit hours for each academic unit (or program) and course level.

PROCEDURE:

1. Obtain projections of numbers of students categorized by majors and student levels.

   The program planning process which precedes the determination of academic facilities requirements normally begins with a projection of the future composition of the student body. Although other approaches are possible, reasons for deviating from what has become an almost standardized procedure.

As a basis for planning academic facilities, the particularly relevant student characteristics which must be made integral to the projection are student major and level of student. Form P-1 on page 7 indicates one way in which the projected student data may be arrayed.

Enrollment projections usually are expressed in terms of head-count students per term. As a result, the projections do not reflect differences in loads taken by different students; all students appear to generate equal loads. Such an assumption is acceptable if:

a. the student body is quite homogeneous and all students do carry generally equal loads; or,

b. the student body is heterogeneous with respect to load carried, but the proportions of the various subpopulations are constant over time.

At some institutions, however, there are two or more identifiable subpopulations of students which generate significantly different loads. Moreover, the proportion of students in each subpopulation may change over time. An example would be the community college which has a full-time resident student body and which also serves a large group of part-time students who are granted release time from work by their employers. The assumption that the proportion of students in each subpopulation will remain constant is very tenuous. Therefore, in such cases, it is suggested that enrollment projections be made independently for each subpopulation and that a separate P-1 Form be completed for each group.

It should be noted that this recommendation refers specifically to the situation in which the different subpopulations of students are enrolled in the same programs. In addition, projections of students enrolled in different programs (e.g., day students vs. evening students) also should be made and recorded separately. This is a standard practice at most institutions in which this situation occurs.

FORM P-1

PROJECTION OF HEAD-COUNT STUDENTS BY MAJOR PROGRAM AND STUDENT LEVEL FOR FALL 19__

MAJOR PROGRAM (2)	STUDENT LEVEL (1)				TOTALS
	LOWER DIVISION	UPPER DIVISION			
	UNDERGRADUATE	UNDERGRADUATE	GRAD 1	GRAD 2	
Undeclared					
Major #1					
Major #2					
.					
.					
.					
.					
.					
.					
TOTALS					

(1) Some institutions may wish to use a different (or finer) categorization (e.g., Freshman, Sophomore, Junior, Senior for a 4-year institution). The levels indicated on the form represent the minimum recommended for an institution with a doctoral program.

(2) The listing of major programs, and any aggregation thereof, must be provided by each institution.

Various procedures for projecting enrollments in accordance with these requirements have been developed and well documented.[1] As a result, no discussion of these procedures is included in these manuals.

2. Calculate instructional loads to be generated or induced by the projected student body.

   The estimation of instructional loads generated by the projected student body can be accomplished in a variety of ways. The primary difference between these techniques is the level of detail involved. The level of detail ranges from projecting enrollments in every course to estimating total student credit hours for the entire student body.

   The controlling variables and the relationships between these levels of detail can be illustrated best through an explanation of the most detailed of these procedures. Generalization to the less detailed levels is accomplished primarily through a series of aggregations which are described briefly on pages 15 through 21.

   The central element in the calculation of projected instructional loads is the Induced-Course-Load Matrix (ICLM). At its most disaggregated level, the Induced-Course-Load Matrix (hereafter referred to as the ICLM) is a table in which the entries are the proportions (decimal fractions) of the total number of students of each level and major expected to enroll in each course in a specified future term. The development of an ICLM is discussed in detail in Section 3 of this manual. One possible format for an ICLM is indicated by Form P-2.

   The calculation of projected course enrollments is accomplished by multiplying each of the entries in the ICLM by the projected number of students of the corresponding major and level and summing the products for each course. The result of this operation is the projected number of students enrolled in each course for the specified future term.

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[1] See for example

Office of Program Planning and Fiscal Management, State of Washington. "Higher Education Enrollment Projection Model," 1970, forthcoming.

Smith, Wayne. "A Student Flow Model." Mimeographed. Los Angeles California: Office of Advanced Planning, University of California at Los Angeles, 1970.

FORM P-2

DETAILED INDUCED-COURSE-LOAD MATRIX(1)

PROJECTED FOR FALL 19__ TERM

COURSE DESIGNATION	STUDENT CHARACTERISTICS(2)												
	MAJOR A				MAJOR B					MAJOR N			
	LOWER DIV	UPPER DIV	GRAD 1	GRAD 2	LOWER DIV	UPPER DIV	GRAD 1	GRAD 2	....	LOWER DIV	UPPER DIV	GRAD 1	GRAD 2

(1) Entries are proportions of students of each major and level expected to enroll in each course.

(2) The student characteristics categories of major and level should be identical with those indicated on Form P-1.

For those institutions which have two or more definable special subpopulations (see the discussions on page six) separate ICLM's and calculations of instructional load are recommended. After the estimated loads generated by each group have been calculated, the total number of enrollments in each course can be obtained by summing across the subpopulations. The result is total enrollments in each course.

3. Determine the Weekly Student-Hour Loads.

   The projected number of enrollments in each course is not sufficiently explicit to serve as a basis for detailed calculations of future facilities requirements. In order to determine the requirements for classrooms and class laboratories, it is necessary to convert this information to number of weekly student-hours (WSH) of classroom and class laboratory instruction. Furthermore, in order to establish the distribution of station-counts required, it is necessary to estimate the number of sections of each size expected to result from the projected course enrollment pattern.

   Given the projected number of enrollments in each course and certain basic pieces of information about each course, calculating distributions of weekly student-hours (WSH) and weekly room-hours (WRH) by size of section and type of instruction is a very simple process. The basic information required on each course is:

   1. Student Credit Hours (SCH) per student
   2. Classroom Weekly Student-Hours (CWSH) per student
   3. Maximum size of classroom sections
   4. Laboratory Weekly Student-Hours (LWSH) per student
   5. Maximum size of laboratory sections
   6. Student Credit-Hours per student attributable to "other" instruction (i.e., independent study, thesis, etc.).[1]

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[1] In most instances this figure will be the same as that for number 1; most courses which have an independent study component do no also have a regularly scheduled classroom component. In some cases, however, it is possible to have a course with a regularly scheduled classroom or class lab component as well as an element of "other" instruction (e.g., associated field trips).

The process for calculating the various WRH and WSH distributions is described below:

a. Multiply the projected number of students registered in each course by (as derived from the ICLM):

   1a. Classroom Weekly Student-Hours (CWSH) per student,
   1b. Laboratory Weekly Student-Hours (LWSH) per student, and
   1c. Student Credit-Hours of other instruction per student,

   respectively. This calculation yields the total number of weekly student-hours of classroom and class laboratory instruction for each course and the total number of student credit-hours attributable to "other" instruction for each course.

b. Determine for each course the number of classroom and class laboratory sections required and the average size of these sections.

   The number of sections required for each type of instruction is determined by dividing the projected number of course enrollments by maximum section size and then rounding upward. The average section size for each type of instruction results from dividing the projected number of students by the rounded number of sections.

c. Determine the weekly room-hour requirements by multiplying number of sections by the number of hours per week the sections meet.

   Separate calculations are required for classrooms and class laboratories.

d. Summarize distributions of weekly student-hours (WSH) and weekly room-hours (WRH) by section sizes.

   The data for all instructional activities conducted in classrooms should be entered in the same distribution. Form C-5 (shown as TABLE 2.5 in Manual Two, Section 2.11 and repeated on page 13 for reference) is used for summarizing these data. The information on Form C-5 is basic to the facilities planning procedures outlined in Manual 2. The data for laboratories should be aggregated according to groupings of courses which can share laboratory facilities. If, for example, an analytical chemistry course requires a separate laboratory, the weekly room-hour (WRH) and weekly student-hour (WSH) data for this course would not be grouped with data from other chemistry courses. Form CL-5 is used for summarizing this data and is similar to TABLE 3.5, Manual Two, Section 3.11, page 14.

e. The total number of student credit-hours of other instruction should be calculated for each course for which the calculation is appropriate and the results summarized by department/organizational unit offering the courses.

f. Calculate the total number of student credit-hours (SCH) for each course by multiplying the projected number of enrollments in each course by the established credit hour value of the course.

COMMENTS ON THE PROCEDURE:

"Other" instructional activities seldom directly generate a requirement ofr facilities (i.e., they are field study or independent study activities which do not require use of classroom or class laboratory facilities). Such activities do, however, generate an important (and growing element of faculty loads. The information on total student credit-hours of "other" instruction taught be each department is, therefore, necessary to the determination of faculty requirements.

FORM C-5

PROJECTED WEEKLY ROOM-HOURS (WRH) AND WEEKLY STUDENT-HOURS (WSH) BY SIZE OF SECTION (SS) FOR CLASSROOMS

SECTION SIZE	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
SS	WRH	WSH

FORM CL-5

PROJECTED WEEKLY ROOM-HOURS (WRH) AND WEEKLY STUDENT-HOURS (WSH) BY DISCIPLINE SECTOR AND SIZE OF SECTION FOR CLASS LABORATORIES

DISCIPLINE SECTOR	SECTION SIZE	WEEKLY ROOM-HOURS	WEEKLY STUDENT-HOURS
	SS	WRH	WSH

DISCUSSION
PROGRAM PLANNING
GENERALIZED PROJECTION OF INSTRUCTIONAL LOADS

DISCUSSION:

The detailed procedures for projecting instructional loads and the associated, detailed procedures for projecting the requirements for classroom and class laboratory facilities serve to illuminate and bring into sharper focus the realities and the phenomena which underlie the planning process. These procedures reflect the complexities of the processes by which students find themselves enrolled in particular courses and by which the pattern of instructional activities (different types of instruction and varying section sizes) finally emerges and takes form. The detailed nature of these procedures and the extent to which they follow the decision-making processes make their use the means by which a planner can obtain an understanding of what is really going on at the institutional level. For this reason, if for no other, the novice planner (or the experienced planner in the process of becoming acquainted with the eccentricities of an unfamiliar institution) should apply these detailed procedures on at least the first pass through the planning cycle.

The extreme amount of effort required to project instructional loads on the basis of the detailed procedures will almost invariably lead the user to search for ways to simplify and shorten the procedures. The following discussion is devoted to an explanation of some possible methods of simplification and their implications.

DATA TO BE DETERMINED:

- Classroom Weekly Student-Hours by academic unit and level of course within each academic unit
- Class Laboratory Weekly Student-Hours by academic unit and level of course within each academic unit
- Student Credit-Hours of "other" instruction by academic unit and level of course within each academic unit
- Total Student Credit-Hours by academic unit and level of course within each academic unit

It should be noted that this less detailed procedure does not yield information on the distributions of size of section. It yields only the total load (by academic unit and level of course) without the additional information which would allow directly projecting the station-count distribution of the classrooms and class laboratories required to house the projected load of instructional activities.

In addition, the class laboratory weekly student-hours are projected only by academic unit and level of course for each academic unit. The data which allows determination of the extent to which facilities can be shared (e.g., by more than one course) are not available as an output of this more generalized procedure.

PROCEDURE:

1. Obtain projections of the number of students, categorized by major and student level.

   The enrollment projections used as the basis for this more generalized procedure are the same as those used for the detailed procedure and summarized on Form P-1, page 7.

   If appropriate, the student characteristics may be aggregated to a greater degree than is indicated on Form P-1. In particular, the number of student levels may be reduced to undergraduates and graduates, for example, if the mix of students of the various levels within these broader categories is not expected to vary significantly. Aggregation of majors is also possible.

   As with the detailed procedures, if there are two or more identifiable subpopulations within the student body, it is suggested that enrollment projections be made independently for each subpopulation and that a separate Form P-1 be completed for each group.

2. Calculate instructional loads to be generated or induced by the projected student body.

   The central element in the calculation of projected instructional loads is the Induced-Course-Load Matrix (hereafter referred to as the ICLM). The form of the ICLM used in conjunction with this more generalized procedure is considerably different from that upon which the detailed procedures are based. First, the categories of student majors and student levels may be aggregated to some extent. Second, the course data will be summarized. This summarization can be accomplished in various ways. Form P-3 illustrates a summary by academic units and by level of course for each academic unit (i.e., all which are of the same level and which are offered by the same

FORM P-3

INDUCED-COURSE-LOAD MATRIX(1)

ACADEMIC UNIT	COURSE LEVEL	STUDENT CHARACTERISTICS(2)												
		MAJOR A				MAJOR B					MAJOR N			
		LOWER DIV	UPPER DIV	GRAD 1	GRAD 2	LOWER DIV	UPPER DIV	GRAD 1	GRAD 2	....	LOWER DIV	UPPER DIV	GRAD 1	GRAD 2
1	Lower													
	Upper													
	Grad													
2	Lower													
	Upper													
	Grad													
.	.													
	.													
	.													
X	Lower													
	Upper													
	Grad													
TOTAL														

(1) There are four entries in each location: (a) Total SCH, (b) Classroom WSH, (c) Class Lab WSH, and (d) SCH of "other" instruction, that the average student of each major and level takes in each academic unit at the indicated course level.

(2) Student characteristics categories may be more or less aggregated than indicated.

academic unit are aggregated and in effect, treated as a single course). Other methods of aggregation could result in summaries by academic unit only, by level of course only, by school or college and level, etc. The higher the level of aggregation, however, the more difficult the translation from instructional loads to class laboratory facilities requirements.

As a consequence of the aggregation of course data, the entries in the ICLM must also take a different form. As a minimum the entries should be the number of student credit-hours that a student with particular major and student level characteristics takes in each academic unit at each course level. However, if this single entry were to be used, further ratios would be required in order to obtain estimates of the number of weekly student-hours of classroom and class lab instruction as well as the student credit-hours of "other" instruction.

In order to obtain the maximum information regarding instructional loads from these calculations, it is recommended that four elements be entered in each location of the ICLM. These elements are:

a. Average number of Student Credit-Hours taken by a student of each major and of each student level in courses of each level within each academic unit.

b. Average number of Classroom Weekly Student-Hours generated by a student of each major and level in courses of each level within each academic unit.

c. Average number of Class Lab Weekly Student-Hours generated by a student of each major and level in courses of each level within each academic unit.

d. Average number of Student Credit-Hours of "other" instruction generated by a student of each major and level in course of each level within each academic unit.

The analytic procedures required to determine the values for the elements in this particular type of ICLM are discussed in Section 3.0 of this manual.

Given the enrollment projections of the ICLM of the form described, the calculations of total instructional loads are accomplished by multiplying each of the entries in the ICLM by the corresponding projected number of students and summing the products across levels within each academic unit.

The end results of these calculations are:

a. Total Student Credit-Hour loads in courses of each level for each academic unit.

b. Classroom Weekly Student-Hour loads in courses of each level for each academic unit.

c. Class Lab Weekly Student-Hours in courses of each level for each academic unit.

d. Student Credit-Hour loads of "other" instruction in courses of each level for each academic unit.

These data are summarized on Form P-4.

Note: For those institutions which have two or more definable subpopulations, separate ICLM's and calculations of instructional load are recommended. Total SCH and WSH may be obtained by summing after the estimated loads generated by each group have been calculated.

3. Calculate Weekly Room-Hour Requirements.

Gross estimates of weekly room-hours required can be calculated by dividing the projected weekly student-hours of classroom and class lab instruction by an estimated average section size. For classrooms, all weekly student-hours can be aggregated and a single, over-all average section size applied or separate estimates of average section size for each course level or academic unit (or combination of academic unit and level) can be developed and weekly room-hours calculated on a relatively more disaggregated basis.

For class laboratories separate estimates of average section size should be developed for each category of academic unit and course level for which weekly student-hour data are available. This requirement is occasioned by the fact that use of laboratories is confined to very few courses whereas classrooms are general use facilities. While it is uncommon that all courses of a given level within a single academic unit can share a single type of lab, these data represent the most disaggregated information available and must be used as proxies for data regarding courses taught in a particular academic specialty.

Form P-5 summarizes the weekly student-hour and weekly room-hour data for classroom and class laboratory instruction which have been calculated through use of these procedures. These data serve as inputs to the general planning methods presented in Manual Two. As noted earliers, the primary failing of these methods is that they do not provide information regarding the distribution of sizes of sections and, therefore, they do not serve to provide a firm basis for estimating the distribution of station-counts required.

FORM P-4

SUMMARY OF WEEKLY STUDENT-HOURS BY TYPE OF INSTRUCTION, DEPARTMENT, AND LEVEL OF COURSE

ACADEMIC UNIT	COURSE LEVEL	TOTAL SCH	WSH OF CLASSROOM INSTRUCTION	WSH OF LABORATORY INSTRUCTION	SCH OF "OTHER" INSTRUCTION
1	Lower				
	Upper				
	Grad				
2	Lower				
	Upper				
	Grad				
.	.				
	.				
	.				
X	Lower				
	Upper				
	Grad				
TOTAL					

FORM P-5

SUMMARY OF WEEKLY STUDENT-HOUR AND WEEKLY ROOM-HOUR DATA BY ACADEMIC UNIT AND LEVEL OF COURSE

ACADEMIC UNIT	LEVEL OF COURSE	CLASSROOMS			CLASS LABORATORIES		
		WSH	AVERAGE SEC. SIZE	WRH	WSH	AVERAGE SEC. SIZE	WRH
1	Lower						
	Upper						
	Grad						
2	Lower						
	Upper						
	Grad						
.	.						
	.						
	.						
X	Lower						
	Upper						
	Grad						
TOTAL							

DISCUSSION

PROGRAM PLANNING

PROJECTION OF THE NUMBER OF FACULTY AND SUPPORT STAFF IN ACADEMIC UNITS

DISCUSSION:

The projection of numbers of faculty members and support staff in academic units is particularly important to the calculation of requirements for office and research laboratory space. These projections pertain also to the determination of library and other academic support facilities needs.

DATA TO BE DETERMINED:

- Projected number of FTE faculty by academic unit and faculty level
- Projected number of FTE secretarial and clerical employees in each academic unit
- Projected number of people who require office space
  - by academic programs and/or units,
  - by size of work-stations required

distributed according to

  - degree of privacy required.

PROCEDURE:

1. Determine the Projected FTE Teaching Faculty Requirements.

Given the projections of instructional load developed in accordance with the previously described procedure, it is possible to estimate the number of FTE instructional faculty required to service this load by application of one of several methods. Each of these techniques is designed to provide estimates of faculty requirements on an academic unit-by unit basis. The variations reflect differences in the staffing policies of various institutions.

The two most common forms of staffing policies are expressed in terms of:

1. Student Credit-Hours (SCH) per FTE faculty or
2. Weekly Faculty Contact-Hours (WRCH) per FTE faculty.

At some institutions instructional load policies are expressed in terms of the number of courses or sections to be taught by each faculty member. A policy expressed in these terms can be converted readily into terms of faculty contact hours. Other institutions establish instructional load policies on the basis of FTE students per faculty member. A policy expressed in these terms can be converted readily into terms of SCH/FTE faculty. Since these two methods of stating faculty loads are generally equivalent to the methods indicated above, they will not be considered separately.

a) Calculation of FTE Instructional Faculty Required when policy is stated in terms of student credit-hour per full time equivalent faculty (SCH/FTE Faculty)

- Summarize Student Credit-Hour Data

The most discriminating set of staffing policies based on SCH/FTE faculty recognizes variations between academic units and between levels of courses within these academic units. As a result, in the most detailed situation, projected student credit-hours correspondingly must be compiled by academic unit and by level of course within each academic unit. These data are readily available as a result of both the detailed and the more generalized methods of calculating instructional loads. One of the outputs of the detailed procedures is total student credit-hours for each course (refer to page 12). These data can be summarized quite easily by academic unit and by level of course within each academic unit. Student credit-hours by academic unit and course level are a direct output of the less detailed approach as is indicated on page 19. Form P-6 provides a useful format for summarizing this data.

- Summarize Faculty Load Policies

This step requires that the institution's policy regarding number of student credit-hours which constitute a full load for a faculty member be stated explicitly. It is expected that such policies will contain differences from one academic unit to the next and from one level to the next. Form P-7 can be used to display faculty-load information in a format consistent with the data on projected instructional loads.

FORM P-6

PROJECTED STUDENT CREDIT-HOUR LOADS BY ACADEMIC UNIT AND LEVEL OF COURSE

ACADEMIC UNIT	LEVEL OF COURSE			TOTAL
	LOWER	UPPER	GRAD	
TOTALS				

FORM P-7

SUMMARY OF FACULTY LOAD POLICIES(1)

(EXPRESSED AS STUDENT CREDIT-HOURS/FTE FACULTY PER TERM)

	LEVEL OF COURSE		
ACADEMIC UNIT	LOWER	UPPER	GRAD

---

(1) Policies expressed in terms of a single factor for each academic unit can be reflected by inserting the same factor for each level within each academic unit. Policies expressed as a single factor for each level can be reflected by inserting the same factor for each academic unit at that level.

- Calculate the number of FTE instructional faculty required in each academic unit.

The number of FTE faculty required to service the demand for courses of each level within each academic unit can be calculated by dividing the projected number of SCH at each level and in each academic unit by the assumed (or prescribed) number of SCH per FTE faculty for the corresponding academic unit and level. The number of FTE faculty required in each academic unit is calculated by summing across all levels for each academic unit.

The number of FTE faculty required in each academic unit can be calculated by dividing the number of SCH entered in each part of Form P-6 by the corresponding policy value of SCH per FTE faculty on Form P-7 and summing across levels. The results are summarized in columns 2 through 5 of Form P-8.

- Subdivide the total number of FTE instructional faculty into "Regular Faculty" and "Graduate Assistant" categories.

As a basis for projecting total faculty (including those engaged in research and public service) in each academic unit, and ultimately for purposes of determining facilities requirements, it is useful to have some information on the composition of the instructional faculty. The most fundamental differentiation is between regular faculty and graduate assistants.

The subdivision of the number of FTE instructional faculty in each academic unit into these two groups can be based on ratios arrived at either as a matter of academic unit policy or as a result of the analysis of historical data. Such ratios may be applied to the entire academic unit staff (e.g., 80% of the academic unit instruction will be done by regular faculty and the balance by graduate assistants) or on the basis of level of course within each academic unit (e.g., 50% of the lower division courses will be taught by regular faculty and 50% by graduate assistants with 100% of the upper division and graduate level courses being taught by regular faculty).

Regardless of the base to which these ratios are applied, the necessary data are summarized in columns 2 through 5 of Form P-8. Columns 6 and 7 can be used to summarize the results of this calculation.

FORM P-8

FTE INSTRUCTIONAL FACULTY REQUIRED

ACADEMIC UNIT (1)	LEVEL OF COURSE			TOTAL (5)	REGULAR FACULTY (6)	T.A. (7)
	LOWER (2)	UPPER (3)	GRAD (4)			
TOTALS						

b) Calculation of FTE Instructional Faculty Required when the policy is stated in terms of Weekly Faculty Contact-Hours per FTE Faculty.

- Determine weekly faculty contact-hours according to institutionally appropriate categories.

As in the previous method, policies expressed in terms of Faculty Contact-Hours per FTE faculty may be differentiated by academic and level of course. In addition it is relatively common to include type of instruction (i.e., classroom, lab, and other) in the statement of policy. As a result weekly faculty contact-hour data must also be categorized by academic unit, level of course, and type of instruction.

Weekly faculty contact hours usually are not calculated specifically. Instead, weekly room-hours are used as a proxy on the assumption that weekly room-hours are equivalent to weekly faculty contact-hours for classroom and laboratory types of instruction. (This means that it is assumed that one hour of a faculty member's time is required for each hour of classroom or laboratory instruction.) This is generally true, although variations do occur by virtue of situations such as those in which one faculty member monitors two or more laboratory sections simultaneously. In situations in which this one-for-one relationship does not hold, an adjustment must be made on the basis of either stated policy or analysis of historical data.

While weekly faculty contact-hours generally can be equated with weekly room-hours for classroom and laboratory types of instruction, no such equivalency exists for the "other" type of instruction. As a result, a substitute measure of faculty load must be employed. This substitute normally takes the form of SCH/FTE faculty. As an alternative approach, a weekly student-hour value can be imputed to the student credit-hours of other instruction; the teaching load is then expressed in terms of WSH per FTE faculty.

The detailed procedures described on pages 5 through 14 yield WRH of classroom and class lab instruction categorized by academic unit and level of course and SCH of "other" instruction, also by academic unit and level of course. The more generalized procedures described on pages 15 through 21 also yield these data. These data are summarized on Form P-9.

FORM P-9

SUMMARY OF INSTRUCTIONAL LOADS BY ACADEMIC UNIT, LEVEL OF COURSE, AND TYPE OF INSTRUCTION

ACADEMIC UNIT	LOWER DIVISION COURSES			UPPER DIVISION COURSES			GRADUATE COURSES			TOTAL		
	(1) CLRM	(1) LAB	(2) OTHER	(1) CLRM	(1) LAB	(2) OTHER	(1) CLRM	(1) LAB	(2) OTHER	(1) CLRM	(1) LAB	(2) OTHER
TOTAL												

)Entries are in terms of projected weekly room-hours

)Entries are in terms of projected student credit-hours

- Summarize the Institution's Faculty Load Policy

This summary can be accommodated on a form exactly like Form P-9 in which the entries are the number of weekly faculty contact-hours (or SCH in the case of "other" instruction) considered to be a full-time faculty load for each academic unit, level of course, and type of instruction.

- Calculate the Number of FTE Instructional Faculty

The number of FTE faculty required in each academic unit to meet courses of different levels and different types of instruction is calculated by dividing the total weekly faculty contact-hours (the entries in Form P-9) by the corresponding number of faculty contact hours per FTE faculty as determined by institutional policy. These data can be summarized in columns 2 through 13 of Form P-10.

- Subdivide the total number of FTE instructional faculty into "Regular Faculty" and "Graduate Assistant" categories.

This operation is basically similar to that described as the final operation of the previously described method (see page 26). The only difference is the inclusion of "type of instruction" as a basis for differentiating between regular faculty and graduate assistants. For example, it is possible to say that all undergraduate laboratory courses will be taught by graduate assistants and that all other instruction will be assigned to regular faculty.

Regardless of the nature of the process by which such differentiations are made, the basic data are included in columns 2 through 13 of Form P-10. The results of this subdivision can be summarized in columns 14 and 15 of this form.

FORM P-10

FTE FACULTY BE ACADEMIC UNIT, LEVEL OF COURSE, AND TYPE OF INSTRUCTION

ACADEMIC UNIT (1)	LOWER DIVISION COURSES			UPPER DIVISION COURSES			GRADUATE COURSES			TOTAL			REGULAR FACULTY (14)	T.A. (15)
	CLRM (2)	LAB (3)	OTHER (4)	CLRM (5)	LAB (6)	OTHER (7)	CLRM (8)	LAB (9)	OTHER (10)	CLRM (11)	LAB (12)	OTHER (13)		
TOTAL														

2. Determine Total Requirements for FTE Regular Faculty.

The procedures described above result in projections of the number of FTE faculty required to serve the instructional programs of each academic unit. The instructional programs, however, are not the only ones housed in academic units Much faculty time is devoted to organized research and to public service programs. The amount of faculty effort devoted to these programs must be considered when the total number of academic staff in each academic unit is being calculated.

The number of FTE faculty to be engaged in research and public service within each academic unit is extremely difficult to project directly. As a result, the common approach is to estimate the relative proportions of faculty effort devoted to each of the primary programs (instruction, research, and public service), and, knowing the number of FTE faculty devoted to instruction, calculate the total.

In order to calculate the total number of FTE faculty, the necessary elements are the projected number of FTE instructional faculty (as summarized on Forms P-8 and P-10) and a projected proportional distribution of faculty effort by academic unit and program (instruction, research, and public service). This distribution is displayed on Form P-11 and represents either a statement of institutional policy concerning the staffing of academic units or the results of an analysis of current faculty activities, modified to reflect expected future changes.

It should be noted that the categories indicated on Form P-11 pertain only to regular faculty and must be consistent with the categories of regular faculty contained on Forms P-8 and P-10. In particular, if the Regular Faculty categories on Forms P-8 and P-10 are subdivided in any way (e.g., between tenured and non-tenured), then columns 2, 3, and 4 of Form P-11 should be similarly subdivided.

The projected total number of FTE regular faculty in each academic unit can be calculated by dividing the estimated number of FTE regular instructional faculty in each academic unit (columns 6 and 14 of Forms P-8 and P-10 respectively) by the percentage of regular faculty effort devoted to instruction within that academic unit (column 2 of Form P-11). If there is more than one category of regular faculty, this calculation should be made for each category. The results of this calculation are summarized on Form P-12.

FORM P-11

PERCENT OF REGULAR FACULTY DEVOTED TO EACH OF THE PRIMARY PROGRAMS BY ACADEMIC UNIT

ACADEMIC UNIT (1)	INSTRUCTION (2)	RESEARCH (3)	PUBLIC SERVICE (4)	TOTAL (5)

FORM P-12

TOTAL FTE FACULTY BY ACADEMIC UNIT

ACADEMIC UNIT	(1) REGULAR FACULTY	(2) TEACHING ASSISTANTS	(3) SECRETARIAL & CLERICAL
TOTAL			

(1) Should be subdivided to reflect differences in office assignment policies, in those institutions in which such differentiations are found.

(2) Includes only graduate assistants engaged in instructional activities. Excludes graduate assistants engaged in research and public service activities. Data brought forward from Forms P-8 and P-10.

(3) See page 35 for use of this column.

3. Determine Number of FTE Clerical Employees in Academic Units.

A wide variety of support personnel is commonly employed in each academic unit. Of the major groups, however, only the secretarial and clerical employees normally generate additional space requirements. Most employees in the other groups perform their activities in space which is determined by factors not directly tied to number of employees. Space for machinists and technicians is included as part of the class laboratory or non-class laboratory service space and is not separately calculated as a function of the projected number of machinists and technicians. As a result, this discussion is limited to the procedures for projecting number of FTE secretarial and clerical employees required in academic units. These procedures require the following operations:

- Establish a basis for projection

The almost-universally accepted basis for projecting number of secretarial and clerical employees in each academic unit is the number of FTE faculty in each. The procedure for projecting this data element were discussed in Steps 1 and 2 previously. The results are summarized in Columns 1 and 2 of Form P-12.

- Specify a clerical staffing policy for each academic department.

This staffing policy may be either explicit or implicit and usually takes the form of a ratio of faculty to clerical employees. An explicit policy statement would be one stating that "one clerical will be provided for every three FTE regular faculty in engineering and physical sciences academic units and for every 5 FTE regular faculty in humanities and social sciences". An implicit policy statement uses current ratios of faculty to clerical employees as a projective basis. The analytic procedures for developing such current ratios is described briefly on page 67 of Section 3.4). Regardless of the way in which they are developed, staffing policies can be summarized on Form P-13.

- Calculate the number of clerical employees required for each academic unit.

FORM P-13

RATIOS OF FTE FACULTY TO FTE CLERICAL EMPLOYEE FOR ACADEMIC DEPARTMENTS (1)

ACADEMIC UNIT	(2) REGULAR FACULTY	(3) TEACHING ASSISTANTS

(1) Entries are in terms of number of FTE faculty per each FTE clerical employee.

(2) Should include appropriate subgroups if there are differential staffing policies for different groups.

(3) Column not used if teaching assistants are not provided with secretarial support.

The projected number of clerical employees for each academic unit can be calculated by dividing the projected number of FTE faculty in each academic unit by the number of faculty members per FTE clerical employee. The results can be entered in the final column of Form P-12. This form then becomes a summary of all employees in each academic unit requiring office space.

4. Group the Employees of each academic unit on the Basis of Differing Requirements for Office Facilities.

Once the number of people in each academic unit who require office space has been determined, the final step necessary to provide the information required for the facilities planning procedures is to specify the size of the work station and the degree of privacy required by these people. The procedure by which this step is accomplished is as follows.

- Specify the office space categories to be used.

For planning purposes, a minimum number of different types of office space appropriate to the needs of each academic unit must be identified. A useful technique is to combine an indicator of station size with an indicator of privacy required. The following categorization illustrates this:

a) Department Chairman Office

b) Regular Faculty Private Office

c) Regular Faculty Two-Man Office

d) Clerical Private Office

e) Clerical Multi-Station Office

f) Graduate Assistant Offices

Degree of privacy is indicated explicitely by the words "private", "two-man", and "multi-station" and implicately by "department chairman" (private) and "graduate assistant" (multi-station). In addition, it is possible to associate a particular station size with each of these categories.

•Assign Projected Numbers of Staff to Office Categories

This operation requires that the projected number of staff members in each academic unit (summarized on Form P-12 in categories of Regular Faculty, Graduate Assistants, and Clerical Employees) be assigned to one of the types of offices previously defined. In most situations this assignment is very straightforward. For example, the following guidelines could be followed:

a) There is one "department" chairman's office for each academic unit.

b) All graduate assistants are assigned to graduate assistant multi-station offices.

c) Private clerical offices will be provided for one secretary in each academic unit. All others will be assigned multi-station clerical office space. In academic units in which there are two clerical employees a two-station office will be provided.

d) Regular faculty will be provided with private offices.

The assignment of the regular faculty to office space categories is generally the largest source of difficulty in this operation. At many institutions, it is common to assign full and associate professors to private offices and assistant professors and instructors to two-man offices. At many community colleges, the relevant grouping may be contract faculty (who are provided with office space) and hourly faculty (who are not). In such circumstances, it is necessary to subdivide the regular faculty category into the components pertinent to the institution's office assignment policies. This subdivision can be accomplished at this point in the procedure or can be reflected in a subdivision much earlier in the procedure (indicated on Forms P-8 and P-10) and carried through to this point.

The results of this process are summarized on Form P-14.

Inasmuch as these procedures are designed to provide a basis for facilities planning, they deal with only selected types of employees in academic units. More extensive calculations would be required to estimate the total number of all types of employees in the academic departments. Such calculations would be required for such applications as budget projections and would be, for the most part, similar in form to that required for the projection of secretarial or clerical employees.

DISCUSSION

PROGRAM PLANNING

INSTITUTIONAL SUPPORT FACILITIES

DISCUSSION:

Institutional support facilities are those facilities which historically have been labeled as Administrative and General Support space. The largest single component of space in this category is the office space required by administrators and secretarial and clerical employees in administrative units. Most of the other types of facilities which can be collected under the general category of institutional support are quite specialized in nature and therefore not particularly suited to detailed projective techniques. Among the facilities which fall into this latter category are such things as central duplicating, receiving, and mail-room facilities.

The fundamental planning problem, therefore, is estimating the number of employees for whom office facilities must be provided. Estimating the numbers of employees in administrative units is much less straightforward than projecting numbers of faculty and support personnel in academic units. In academic units, the number of employees can be related functionally to one or more easily quantified indicators of load such as student credit hours (SCH). However, in administrative units, projections of only certain groups of employees can be calculated on the basis of a functional relationship with some other quantifiable measure. For example, the number of clerical employees in the registrar's office could be related functionally to the total number of students at the institution. For the most part, the required number of many types of administrative employees is determined largely by organizational philosophy, operating style of the chief executive officer, or institutional tradition. This situation is particularly common with regard to higher-level administrative personnel (or the non-academic professional personnel) within the institution. For example, the numbers of staff members in the Planning Office, or the Office of Public Relations, or the Alumni Office, are determined more by operating philosophies and policies than by any other single factor.

The situation at most institutions is such that two very different sets of projective techniques must be used in combination in order to estimate the number of employees of administrative departments at some future time. One set of techniques is almost completely subjective; the other is much more objective and is based on establishing a functional relationship between the number of staff required and some other variable. In both cases, the necessary final result is number of employees by type in each unit who will require office space. For facilities planning purposes these data also must be categorized according to size of station and degree of privacy required (i.e., single- vs. multiple-occupancy). This latter requirement can be satisfied only if policy regarding assignment of space is such that specific categories of employees can be identified as requiring a particular amount of space and if the number of employees in each category can, in fact, be projected. For example, if it can be established that secretarial and clerical employees are entitled to 90-square-foot stations in multiple occupancy rooms, and if number of clerical and secretarial employees can be projected, then it is possible to provide the necessary inputs to the facilities planning process.

The basic planning process for institutional support facilities, therefore, requires defining space categories, associating particular groups of employees with each of these space categories, and, finally, developing projections of numbers of employees in each group and in each organizational unitt.

DATA TO BE DETERMINED:

- Number of persons in each non-academic unit who require office space
    - by program and/or unit
    - by size of work-station required

  distributed according to

    - degree of privacy required

  and adjusted for

    - "multi-shift" use.
- Projected total number of FTE non-academic professionals
- Projected total number of FTE secretarial and clerical employees in non-academic units.

PROCEDURE:

1. Specify the space categories.

   The categories to be specified should be differentiated by type of employee and type of space required. In most cases, four to six such categories should be enough to differentiate space requirements in sufficient detail for purposes of facilities planning. Without question, the definitions of these categories will vary from one institution to the next. The following illustrate a possible set of space categories:

   a) Executive, Single-Occupany--the type of office assigned to an executive officer or head of a major administrative unit.

   b) Professional, Single-Occupancy--the type of office assigned to "middle-management", heads of second-level administrative units and other middle level administrative professionals. Such an office commonly would be of the same approximate size as a single occupancy faculty office.

   c) Professional, Multi-Occupancy--the type of office assigned to lower-level professionals (for example, in some larger institutions, buyers in the purchasing department could be placed in this category).

   d) Clerical, Single-Occupancy--the type of office assigned to an executive secretary or to a secretary in a unit having only a single clerical employee.

   e) Clerical, Multi-Station--the type of office space normally provided to secretarial and clerical employees in units with two or more such employees.

   f) No Office Space--Many employees of administrative units perform their activities in space which is generated by, and required for, other activities. Although such personnel may not influence facilities requirements, projection of their number is recommended in order to present a complete program planning basis for other institutional uses. An example of such an employee could be a receiving clerk or plant security officer; the former works in space generated by volume of merchandise, the latter works outdoors or in campus building space.

2. Associate groups of employees with each space category.

This step requires identifying the various types of employees in each unit and assigning them to one of the identified types of space specified in Step 1. The only realistic way to approach this problem is to perform a thorough analysis of existing staffing patterns. The basis for such an analysis is an inventory which reflects the institution's personnel classification system and departmental structure. Form A-10 arrays the results of this step.

3. Project the future number of employees expected to require each type of space for each unit.

The (current) inventory of personnel, discussed in Section 3 of this manual and summarized on Form A-9, provides the basis for projecting staff requirements for some specific time in the future. The process of projecting staff requirements primarily involves analyzing current staffing patterns as revealed by the inventory, describing a basis for projecting future requirements, and carrying out the projections.

Projection of future number of employees is a highly subjective process. Initially, the personnel inventory, illustrated in Form A-9, must be reviewed in order that the projective basis for each (potential) entry may be determined. This basis for projection may be either subjective or objective, as noted previously. The former, subjective projection, deals with those groups of employees for which no formula based methods of projections are applicable. The latter, objective projection, describes techniques used for groups of employees whose numbers can be projected on the basis of functional relationships with other institutional variables.

Accordingly, it is necessary to:

a) Identify those groups of employees whose numbers must be projected subjectively; and,

b) Specify the formulae which are used to project the numbers of personnel in each of the other groups.

It should be noted that the techniques applied to projecting the required number of employees in any particular group may be markedly different from one institution to another. For example, the number of personnel administrators may be projected subjectively at a small institution but may be functionally related to the number of clerical and support employees at a larger institution.

The end result of this rather intangible process is a projection of the number of employees of each cateogry in each organizational unit. The results of this process may be summarized on Form P-14. Some additional information can be provided if separate forms are compiled for those employees for whom projection is subjective and those for whom projection is on the basis of some formula.

In estimating personnel needs for a new institution, there are no historical data which can be used as an analytic base. Under these circumstances it is necessary to complete a form similar to Form P-14 without benefit of hindsight. Working from an organization chart which summarizes the departmental structure is one way in which such estimates can be generated in basically the same way as previously described.

FORM P-14

PROJECTED NUMBER OF EMPLOYEES IN NON-ACADEMIC UNITS

(BY TYPES OF OFFICE FACILITIES REQUIRED AND DEPARTMENTS)

NON-ACADEMIC UNIT	EXECUTIVE	TYPES OF OFFICE SPACE REQUIRED				TOTAL
		PROFESSIONAL		CLERICAL		
		SINGLE-OCCUPANCY	MULTI-OCCUPANCY	SINGLE-OCCUPANCY	MULTI-OCCUPANCY	
TOTAL						

DISCUSSION

PROGRAM PLANNING

AUXILIARY ENTERPRISE FACILITIES

DISCUSSION:

Program planning associated with projection of auxiliary enterprise facilities requirements, for the most part, is little more than a restructuring of the enrollment projections. For purposes of projecting requirements for academic facilities, student level and major program are the important elements. Projecting requirements for residence, dining, and other auxiliary enterprise facilities demands an almost completely different set of student characteristics. Because the required student characteristics information varies widely from institution to institution, this section will discuss only the general procedures.

DATA TO BE DETERMINED:

- Projected total number of students in each of the institutionally specified categories.
- Projected total numbers of
  - Married students
  - Single students
- Projected number of diners to be served at each meal of the day.

PROCEDURE:

1. Determine the student characteristics felt to be appropriate for calculating requirements for auxiliary enterprise facilities.

   Student characteristics such as sex, marital status, student level, and place of residence are frequently appropriate. In addition to these, special institutional housing policies may make it necessary to chart other student characteristics. The existence of language houses makes major program of the student a relevant characteristic. Participation in extracurricular activities becomes a meaningful characteristic if varsity athletes are provided special housing. Health care may be provided only to full-time students, making this an important characteristic for projecting auxiliary enterprise facilities. The possibilities are so numerous that any planning which recognizes such factors necessarily must be tailor-made for the particular institution. It is impossible to include all such variations in this generalized methodology.

All institutions obviously will not require all data. Information on student sex is unnecessary for the institution which never will become co-educational. Housing policies may apply only to Freshmen, thus eliminating level of student requirements other than "Freshmen" and "all other".

2. Organize the enrollment-projection data into the institutionally relevant student-characteristics format devised in Step 1.

   Form P-15 illustrates one format for organizing enrollment-projection data in a way which meets the basic requirements for projecting auxiliary enterprise facilities needs.

FORM P-15

PROJECTED STUDENT ENROLLMENT DATA

(BY CATEGORIES RELEVANT FOR PROJECTION OF AUXILIARY ENTERPRISE FACILITIES)

	LEVEL OF STUDENT	SINGLE		MARRIED	
		MALE	FEMALE	MALE	FEMALE
Live Within Commuting Area	LEVEL 1				
	2				
	. . .				
	K				
Live Outside Commuting Area	LEVEL 1				
	2				
	. . .				
	K				

PROGRAM ANALYSIS

Inasmuch as the role of program analysis is to support the decision-making and planning processes, its form is determined by the requirements of these processes. Whereas planning basically is concerned with the projection or estimation on the basis of certain relationships between the variables in the system, analysis is concerned with obtaining insight into these relationships through investigation of their historical form.

In the process of describing the program planning methodologies, several areas were identified which required an analysis of historical data. While many of these areas are common to a large number of institutions, it must be recognized that what is grist for analysis at one institution may well not be at another (e.g., at some institutions the relationships between instructional loads and faculty requirements require analytic treatment, whereas at others this relationship is fixed by legislative formula).

In the discussion that follows, an attempt is made to present the more common forms of analysis required in support of the program planning process.

DISCUSSION

PROGRAM ANALYSIS

THE INDUCED COURSE LOAD MATRIX

In order to project, as accurately as possible, the nature of the instructional load to be generated by students in the future, it is helpful to analyze the relationships between present students and present instructional loads.

At the most detailed level, this analysis takes the form of an investigation of the distribution of students (categorized by major and student level) enrolled in each course. The data required as a basis for this analysis are summarized on Form A-1. At those institutions in which distinct subpopulations of students have been identified (refer to page six for a discussion of this topic), it is recommended that data relative to each group be summarized on a separate form.

Thorough analysis of these data requires that they be gathered for a number of years, examined for stability or instability, and investigated in detail to identify trends. In order to convert the data contained on Form A-1 into data suitable for comparative analysis, these data must be normalized (i.e., the entries must be converted from absolute values to decimal fractions). This is accomplished by dividing each entry by the total number of students in the category (the bottom entry in each column). The entries in the resultant table are the proportions of students of level (k) and major (m) enrolled in each course. This table is commonly referred to as a crossover matrix or an Induced Course Load Matrix (ICLM).

FORM A-1

COURSE ENROLLMENTS BY MAJOR AND LEVEL OF STUDENT[1]

COURSE NUMBER	MAJOR A				MAJOR B				....	MAJOR N				TOTAL NO. OF ENROLLMENTS IN COURSE
	LOWER DIV	UPPER DIV	GRAD 1	GRAD 2	LOWER DIV	UPPER DIV	GRAD 1	GRAD 2		LOWER DIV	UPPER DIV	GRAD 1	GRAD 2	
TOTAL[2]														

---

[1] Each entry in this form is the number of students of each major and level enrolled in each course.

[2] The entries in this row are total numbers of students of each major and level -- not the summation of entries in the column because one student registers for several courses. The entries in this row should sum to the total number of students.

For planning purposes, it is necessary to estimate what the entries in the ICLM will be in the projection year. Quite obviously, developing a projected Induced-Course-Load Matrix from scratch could be a prodigious task, even for a small institution. As a result, it is common to develop the ICLM for the current year and alter it selectively to arrive at an ICLM for the projection year. These selective alterations can be initiated in either of two ways, both of which are much more easily said than done.

1) Where specific curriculum changes can be identified, entries can be changed subjectively to reflect the expected effects of these changes.

2) Where analysis of historical data reveals trends the entries in the ICLM can be changed to reflect the expected effects of these trends.

It is evident that the number of possible entries in a detailed ICLM can be exceedingly large, even for a very small college. Even recognizing that the actual number of entries will be only a small percentage of the number of theoretically possible entries, any thorough analysis of the ICLM at this level of detail requires a great deal of effort.

In view of this situation, it is worthwhile to investigate ways in which data can be aggregated in order to obtain information which will be useful in many situations but which will require less voluminous and detailed data. Some of the devices which can be employed to reduce the amount of detail involved are:

1) Reduce the number of student levels used. At an institution with graduate programs, the number of levels can be reduced to two (graduate and undergraduate). At a 4-year institution, it may be possible to dispense with student levels and categorize students only by major program. Given this form of aggregation, the entries in an ICLM remain proportions of students in each category of major and level registered in each course.

2) Reduce the amount of course data by aggregating the departments offering the courses and the levels of courses (suggested levels are lower division, upper division, and graduate). In effect, this aggregation results in treating all courses which are of the same level and which are taught by the same department or group of departments as a single course.

Form A-2 can be used to collect the basic data in this more aggregated form. It should be noted that the data to be entered on this form must be something other than course registrations since they do not represent a uniform measure of instructional load which can be aggregated meaningfully. For example, a registration in one course may result in one credit hour's worth of activity while a registration in another course of the same level taught by the same department may result in four credit hour's worth of instructional activity. As a means of maintaining validity, therefore, the aggregation must be in terms of some data element which gives a true indication of instructional load for each course. Student credit-hours and weekly student-hours are data elements which meet the requirements.

A thorough analysis requires inclusion of the following four data elements on Form A-2:

a) Student credit-hours (SCH)

b) Classroom weekly student-hours (CWSH)

c) Lab weekly student-hours (LWSH)

d) Student credit-hours of other instruction

With these data available it is possible to perform a variety of analyses. In particular, it is possible to determine the nature of the instructional loads at each level of course and within each department.

As with the detailed data, the most productive analyses of these data are those in which data for a number of years are compared and trends and variations identified. In order to compare the data on Form A-2 over time, they must be normalized. Normalization is accomplished by dividing each entry on Form A-2 by the number of students in the corresponding category (i.e., each entry should be divided by the final entry in the corresponding column). The result is a table in which the entries are the average number of student credit-hours (or weekly student-hours) that a student at level (k) and major (m) takes in department (c) at course level (j).

A further type of simplification is to deal only with student credit hours on Form A-2 and to investigate the relationships between weekly student hours and student credit hours in subsequent analyses. This allows deleting data on WSH by level and major of student. As a result, the process is one by which the impact on student credit hour loads in each department is analyzed and then WSH loads are investigated for each level within each department. Unfortunately, this particular type of simplification can create inaccuracies since it erroneously assumes that (say) 100 SCH in lower-division physical science courses represent the same proportions of lab and non-lab WSH, whether induced by lower-division social science majors, or by upper-division engineering majors. As a result, this simplification is not recommended. Use of all four data elements is suggested.

FORM A-2

INDUCED-COURSE-LOAD MATRIX(1)

		STUDENT CHARACTERISTICS(2)							
		MAJOR A		MAJOR B		....	MAJOR N		TOTAL
		UNDERGRAD	GRAD	UNDERGRAD	GRAD		UNDERGRAD	GRAD	
	LOWER								
1	UPPER								
	GRAD								
	LOWER								
2	UPPER								
	GRAD								
	LOWER								
3	UPPER								
	GRAD								
	.								
.	.								
	.								
	LOWER								
X	UPPER								
	GRAD								
	TOTAL								

(1) Four data elements are required for each entry. These elements are:

a) Total number of student credit-hours a student at level (k) and major (m) may take in discipline (i) at level (j)

b) Total number of weekly student-hours of classroom instruction

c) Total number of weekly student-hours of laboratory instruction

d) Total number of student credit-hours of other instruction

In addition, data concerning the total number of students in each category are required to complete the bottom row of the Form.

(2) Student characteristics categories may be more or less aggregated than indicated.

DISCUSSION

PROGRAM ANALYSIS

DISTRIBUTION OF INSTRUCTIONAL ACTIVITIES BY SIZE OF SECTION

For facilities planning purposes, it is particularly useful to analyze the distribution of weekly room-hours and weekly student-hours of classroom and class lab activity by size of section. In order to estimate the number of classrooms and laboratories of each particular station-count which will be required, it is necessary to estimate the number of hours per week of classroom and lab use distributed by sizes of sections. Compilation and analysis of current data by section size range can provide a basis for estimating this distribution. Ranges of section size rather than exact section sizes are used in order to confine the amount of data within manageable proportions. The ranges are usually designed to be smaller at the low end of the scale and larger at the upper end. Illustrative ranges are: 1-4, 5-9, 10-14, 15-19, 20-29, 30-39, 40-49, 50-59, 60-79, 80-99, 100-124, 125-149, 150-200. Ranges of any size can be used, including ranges of size one (i.e., exact section sizes may be used). Since classrooms are usually considered to be general assignment space while class laboratories are usually assigned for use by a single academic unit, the methods of aggregating data for the two types of space are somewhat different. Therefore, the following discussion deals with these two types of space separately.

a) Classrooms

Compilation of current classroom usage data by sizes of sections can be accomplished in various ways. For example, the compilation can be based on academic unit, on level of course, or on the combination of academic unit and level of course. In any event, the raw data are the same and consist of:

1) Course and section designations (including information on level of course and academic unit offering the course),

2) Number of students registered in the course (section),

3) Number of hours per week the section meets (WRH), and

4) Number of weekly student-hours (WRH x Number of Students).

Most of these data are available on class (section) lists. They can be listed on Form A-3. Some useful information can be

FORM A-3
COURSE SECTION DATA(1)
CLASSROOMS ONLY

COURSE - SECTION DESIGNATION(2)	WRH	# STUDENTS	# WSH

(1) A separate line should be completed for each section meeting in a classroom.

(2) The course section designation must serve to identify the level of the course and the academic unit in which the course is offered.

obtained simply by analyzing the data entered in Form A-3. In particular, it is possible to gain some insight into the extent of variation in the section size of the same course.

Having gathered the data according to the format of Form A-3, they can be summarized in a variety of ways. The manner chosen depends on the prevailing situation at the particular institution. An attempt should be made to determine the form of aggregation which yields the most stability over time. A full analysis of these relationships, therefore, requires that data be compiled in a variety of different ways over a period of years and the results compared. As indicated previously, the data can be aggregated by level of course, by academic unit or by a combination of academic unit and level of course. Form A-4 represents a means of aggregating the required data by level of course.

FORM A-4

WSH AND WRH IN CLASSROOM BY LEVELS OF COURSES AND SECTION-SIZE RANGES

SECTION SIZE RANGE	LOWER-DIVISION COURSES			UPPER-DIVISION COURSES			GRADUATE-LEVEL COURSES		
	WSH	WRH	WSH/WRH	WSH	WRH	WSH/WRH	WSH	WRH	WSH/WRH
TOTAL									

FORM A-5

WEEKLY STUDENT-HOURS AND WEEKLY ROOM-HOURS OF CLASS LABORATORY INSTRUCTION BY ACADEMIC UNIT, COURSE LEVEL, AND RANGE OF SECTION SIZE

ACADEMIC UNIT	LEVEL		SECTION SIZE RANGE							
1	Lower	WSH								
		WRH								
		WSH/WRH								
	Upper	WSH								
		WRH								
		WSH/WRH								
	Grad	WSH								
		WRH								
		WSH/WRH								
.	.	. . .								
X	Lower	WSH								
		WRH								
		WSH/WRH								
	Upper	WSH								
		WRH								
		WSH/WRH								
	Grad	WSH								
		WRH								
		WSH/WRH								

From the data available on Form A-4 it is possible to develop a distribution of WSH of classroom instruction according to section size and level of course. In addition, from the columns labeled WSH/WRH, it is possible to calculate average section size within each of the ranges.

b) Class Laboratories

The basic data on class laboratories also can be collected on Form A-3. Current class lab data (as a minimum) must be aggregated by academic unit. Additional useful information also is obtained if the data are categorized by levels of courses. For most institutions the amount of class laboratory data will be limited since a restricted number of academic units require laboratory instruction, since laboratory instruction is seldom required at more than 2 levels in any one academic unit, and since the laboratory sections tend to be distributed over very few size ranges in any academic unit. Form A-5 can be used to collect the basic data concerning the distribution of WSH and WRH of laboratory sections by academic unit, level of course, and section-size range.

The information summarized on Form A-5 provides the basis for developing a distribution of the WSH of laboratory instruction according to ranges of section size, academic unit, and level of course. The average size of the sections within each range is included on Form A-5 (the columns labeled WSH/WRH).

The basic data required to complete Forms A-3 and A-5 are commonly available from an institution's section lists. Such lists indicate the type of instruction (classroom or lab) and the size of the section. This information and the additional element of number of hours per week that each station meets, are sufficient to complete these forms (assuming department and level can be deduced from the course designation).

DISCUSSION

PROGRAM ANALYSIS

ANALYSIS OF FACULTY ACTIVITIES

In order to provide the foundation from which to project total departmental staffing requirements, it is useful to summarize certain information resulting from an inventory of faculty and an analysis of their activities.

The first step in the process is development of a current inventory of faculty employed in each academic unit. In such an inventory there are two items of particular interest, the individual's rank and his "full-timeness." Form A-6 serves to illustrate the nature of the data required by such an inventory.

From the data contained on Form A-6, two types of analysis can be performed:

1) Distribution of faculty by rank, and

2) Relationships between FTE and Head-Count numbers of faculty.

Both types of analysis have bearing on the facilities planning process. Since the amount of space assigned to faculty members often varies by rank, some knowledge of the distribution of faculty by rank is important. Further, since office space must be provided for individuals rather than full-time equivalents of individuals, information on the number of part-time faculty can be very useful in determining needs for office space. It is also helpful to be able to convert full-time equivalents to head counts for purposes of determining requirements for parking facilities, dining facilities, and other facilities the use of which is determined by an individual's presence rather than by his work-load.

FORM A-6

FACULTY INVENTORY(1)

ACADEMIC UNIT	FULL-TIME EQUIVALENT						HEAD-COUNT					
	PROF.	ASSOC. PROF.	ASST. PROF.	INST.	GRAD. ASST.(2)	TOTAL	PROF.	ASSOC. PROF.	ASST. PROF.	INST.	GRAD. ASST.(2)	TOTAL
TOTAL												

(1) The categories of rank should coincide with those in use at each institution.

(2) In the columns headed "Graduate Assistant," it is common to enter only that data which pertains to individuals engaged in instruction (i.e., research assistants are excluded).

Another element is the analysis of the distribution of faculty efforts. Specifically required is information on the way in which the regular faculty of each academic unit distributes its time over the three primary programs of instruction, research, and public service. This information can be summarized on Form A-7. When these data are analyzed over time, it is possible to determine the changing program emphases in the various academic units (e.g., the relative growth of research).

It should be noted that this distribution of effort (or time) is for the faculty of an academic unit collectively rather than individually. It is intended to be only a relatively gross indicator and can be based on such things as sources of salary dollars as well as surveys of individual faculty efforts.

A final step involves a somewhat more detailed analysis of effort devoted to instruction. In particular, it is useful to determine the number of FTE faculty devoted to instruction of courses of each level within each academic unit. Furthermore, it is useful to determine the distribution of effort between regular faculty and graduate assistants. These data can be displayed on Form A-8. When these data are analyzed in conjunction with instructional load data, it is possible to obtain some information basic to formulation of faculty load estimates. For example, it is possible to calculate ratios of:

1) SCH/FTE Faculty by level of course, and

2) Weekly Faculty Contact-Hours/FTE Faculty by level of course.

FORM A-7

DISTRIBUTION OF FACULTY EFFORT

ACADEMIC UNIT (1)	INSTRUCTION (2)	RESEARCH (3)	PUBLIC SERVICE (4)	(5)	NUMBER OF FACULTY ENGAGED IN RESEARCH
				100%	

(1) Entries in columns 2, 3, and 4 should be percent of effort of the total regular faculty of each academic unit devoted to each of the three primary programs. The entries in columns 2, 3, and 4 should sum to 100%.

(2) The entries in column 6 should be number of faculty members in each academic unit engaged in research -- regardless of extent of involvement.

FORM A-8

DISTRIBUTION OF INSTRUCTIONAL EFFORT BY LEVEL OF COURSE[1]

	LOWER DIVISION			UPPER DIVISION			GRADUATE		
ACADEMIC UNIT	REGULAR	GRAD. ASST.	TOTAL	REGULAR	GRAD. ASST.	TOTAL	REGULAR	GRAD. ASST.	TOTAL

---

[1] Entries are FTE faculty of each rank devoted to instruction of courses of each level.

Some institutions, most notably community colleges, have what amounts to two separate faculties (for example, a full-time or contract faculty for day classes and a part-time or hourly faculty for night classes). In such situations, the facilities provided the two groups and the distribution of effort within the two groups generally is radically different. As a result, it is recommended that the required data for each group be compiled and summarized separately.

The analysis of faculty activities historically has been the subject of a great deal of study -- and controversy. The result has been a proliferation of different techniques which can be employed to acquire the basic data necessary to complete Forms A-7 and A-8. There is a sufficient amount of published work in this area to make a detailed discussion in this manual unwarranted. See the bibliography for references on this subject.

DISCUSSION

PROGRAM ANALYSIS

INVENTORY AND ANALYSIS OF SUPPORT STAFF REQUIREMENTS

An inventory of an institution's current support staff provides the information needed to project the number of support staff required at some future time. [As used here, "support staff" are all employees of an institution, except faculty (with teaching assistants being considered faculty)]. As background information for facilities planning, this inventory need include only two basic dimensions--the academic unit with which an individual is affiliated and the nature of the individual's facilities requirements. Personnel data at most institutions, however, are almost always kept in terms of positions or skill levels of employees and seldom, if ever, in terms of the nature of their facilities requirements. Since it is almost always preferable to use existing data, an inventory expressed in terms of academic units and skill levels is most practical. Such a categorization can be accomplished in accordance with any one of a number of schemes, but requires that:

1) The categories be constructed so that a single set of projection techniques and facilities requirements may be applied to employees in each category within each organizational unit; and

2) The number of categories be kept to a minimum in order to ease the burden of calculation.

Form A-9 illustrates one possible format for collecting personnel inventory data.

The skill-level categories on Form A-9 are the categories described in the Fair Labor Standards Act. Although any similar categorization can be used, this particular system has three advantages:

1) It is a standardized structure by virtue of its origin in federal legislation;

2) The data are available as a result of federal reporting requirements; and,

3) The categories are defined in a way which tends to eliminate the use of more than one projection technique for personnel within a given department and job category.

These categories are defined in Section 10 of the Fair Labor Standards Act.

There are some disagreements as to the nature of the data to be entered in Form A-9. Some argue for data entries in terms of FTE staff; others, in terms of head-count staff. There are sufficient arguments on each side to warrant collection of both types of data.

1) It is common to assign space to some personnel on the basis of head-count numbers. For example, it is a common to assign an administrative office space for the sole use of a person who devotes only half-time to administrative functions. Such a practice can be justified on a number of grounds (function, location, "appearances," etc.). Maintenance of head-count data allows accommodation to a variety of institutional conditions and policies. It also provides the basic data necessary to planning parking areas and similar types of facilities.

2) There are many activities which normally are performed by part-time employees, especially in the areas of service and clerical activities. Typically, in such cases, one work station is provided for two or more part-time employees, depending on how many hours (and which) each works. Thus, there also are situations in which FTE data are useful. In addition, the FTE data provide background information for budget projections and other administrative applications.

As a result of these considerations, it is suggested that both FTE and head-count data be displayed in accordance with the format suggested in Form A-9. Both sets of data, or segments of both sets, are necessary for meaningful projection of the number of support personnel.

Once the personnel data are available in terms of job categories, it is necessary that they be rearranged to conform with the requirements of the facilities planning procedures. On the assumption that the primary requirement of support employees is office space, the personnel data contained in Form A-9 can be rearranged to the format of Form A-10.

It should be noted that there is not necessarily a fixed conversion of data in Form A-9 to that in Form A-10. The conversion is carried out on an academic unit by unit basis with no requirement that the conversion be the same in all units. For example, the nonacademic professionals in one academic unit may require private offices whereas the non-academic professionals in another unit may be provided double-occupancy offices.

On the basis of the data summarized on Forms A-9 and A-10 a wide variety of different analyses can be performed. In particular, the staffing patterns of each different organizational unit can be investigated. Such analyses provide the basis for the projective techniques discussed in Section 2 of this manual.

FORM A-9

INVENTORY OF NON-ACADEMIC SUPPORT STAFF BY DEPARTMENT AND F.L.S.A. JOB CLASSIFICATION CATEGORY

ACADEMIC UNIT	F.L.S.A. CLASSIFICATIONS								
	OFFICIALS & MANAGERS	(NON-ACAD.) PROFESSIONALS	TECHNICIANS	SALES	OFFICE & CLERICAL	SKILLED CRAFTSMEN	OPERATIVES (SEMI-SKILLED)	LABORERS (UNSKILLED)	SERVICE WORKERS TOTAL
TOTALS									

FORM A-10

OFFICE SPACE REQUIREMENTS OF SUPPORT EMPLOYEES BY ACADEMIC UNIT AND TYPE OF OFFICE SPACE NEEDED[1]

ACADEMIC UNIT	EXECUTIVE	PROFESSIONAL		CLERICAL		OTHER SPACE (SPECIFY)	NO SPACE REQUIREMENTS	TOTAL
		SINGLE	MULTIPLE	SINGLE	MULTIPLE			
TOTALS								

---

[1] Suggested that forms be completed using both FTE and head-count data.

DISCUSSION
PROGRAM ANALYSIS
ANALYSIS OF RESIDENTIAL AND DINING PATTERNS

The analysis of the use of residential and dining facilities consists primarily of investigating the living and dining patterns of the subgroups of the student body identified in the program planning section.

Form P-15 (page 47) summarizes projected enrollment data in a format suitable for projecting requirements for most auxiliary enterprise facilities. If an institution has two distinct student bodies (for example, full-time students and part-time students), a separate form should be completed for each.

The analysis of historical data required in support of planning methodologies for auxiliary enterprise facilities starts with compiling historical enrollment data in the format of Form P-15 (or the equivalent form used by the institution in program planning for auxiliary enterprise facilities). For reference purposes this form is repeated here as Form A-11. As a base, data regarding the total student body should be entered on this form. The next step in analyzing housing patterns is to complete a similar form showing characteristics of students currently living on campus. By contrasting this information with comparable data for the entire institution it is possible to investigate the results of current housing policies and investigate current sources of demand for residential facilities.

Analysis of demand for dining facilities is best accomplished through use of data normally collected as part of the daily routine in a food service operation. In particular, it is common to keep data for each meal on the number of meals served (often subdivided by contract and cash customers where appropriate). Operating arrangements normally are such that the total possible clientele for a dining hall is quite rigidly defined. (For example, residents in a certain dining complex may be expected to eat in an associated dining hall). Knowing the total clientele group and the number that make demands upon the dining hall for each meal, it is possible to draw some conclusions about dining patterns at the institution.

Note: The clientele group for some facilities may, of necessity, be defined as "all students not specifically assigned elsewhere." The analysis proceeds in the same fashion for this group.

FORM A-11

CURRENT NUMBER OF STUDENTS

		SINGLE		MARRIED	
		MALE	FEMALE	MALE	FEMALE
Live Within Commuting Area	LEVEL 1				
	2				
	. . . .				
	K				
Live Outside Commuting Area	LEVEL 1				
	2				
	. . . .				
	K				

DISCUSSION

DATA REQUIREMENTS FOR PROGRAM ANALYSIS

INTRODUCTION

The analyses of an institution's current operations which have been described in Section 3 of this manual cannot be accomplished without the availability of the required data.

The following sections summarize, very briefly, the basic data required to provide the analytic foundation for the planning methodologies presented in this manual. This section does not list all the data required for the various types of analyses commonly conducted at an institution (e.g., cost data are not included). Rather, this section should be viewed as indicating the minimum data file required as a basis for effective facilities planning--it should not be viewed as defining a recommended data file.

DISCUSSION

DATA REQUIREMENTS FOR PROGRAM ANALYSIS

STUDENT DATA

To adequately support the program analysis methodologies described in this manual, the following data should be available for each student enrolled at the institution.

a. Major - degree program in which the student is enrolled. For students not officially enrolled in a specific degree program, an "Undeclared" or "Undecided" major should be indicated.

b. Level - The WICHE Student Data Elements Dictionary lists 12 student levels. These levels and a recommended aggregation into 4 levels for analytic purposes are as follows:

1. Freshman	Lower Division Undergraduate
2. Sophomore	
3. Junior	Upper Division Undergraduate
4. Senior	
5. Fifth year Undergraduate	
6. Undergraduate Special	
7. Graduate Special	Graduate 1
8. Masters Candidate	
9. Professional Degree Candidate	
10. Doctoral Candidate, early stage	
11. Doctoral Candidate, last stage	Graduate 2
12. Post-Doctoral	

c. Current course enrollments - the designations for each of the courses in which the student is enrolled. From this data it is possible to determine the full-time/part-time status of the student.

d. Sex

e. Marital Status

f. Home address - in particular, an indication of whether or not a student lives within commuting distance of the campus.

DISCUSSION

DATA REQUIREMENTS FOR PROGRAM ANALYSIS

COURSE DATA

The following information concerning each course is required to provide the analytical basis necessary as a foundation for the facilities planning process:

a. Organizational Unit - the academic unit offering the course.

b. Course Level - The WICHE Data Element Dictionary lists 5 specific course levels. These 5 levels and the suggested aggregation for analytic purposes are:

1. Preparatory	Lower
2. Lower Division	
3. Upper Division	Upper
4. Upper Division & Graduate	
5. Graduate	Grad

c. Student Credit Hours -

d. Weekly Student Hours of Classroom Instruction - the number of hours per week, per student, that the course meets for instruction in classrooms (lecture, recitation/discussion, seminar).

e. Classroom Section Size - Either the desired or the maximum number of students per classroom section. If a course is taught in such a way as to have classroom sections of different sizes (e.g., lecture and recitation/discussion groups), it should be treated as 2 courses.

f. Weekly Student Hours of Laboratory Instruction - The number of hours per week, per student, that the course meets in laboratories.

g. Laboratory Section Size - The desired or maximum number of students per laboratory section.

h. Student Credit Hours of "Other" Instruction -

A Possible Collection Form For These Data Is:

		TOTAL	CLASSROOM		LABORATORY		OTHER
Course Identifier*	Dept.	SCH	WSH	SS	WSH	SS	SCH
101(1)	Chem.	4	1	300	3	80	--
			2	20			
103	Eng.	3	3	30	--	--	--
501	Phys.	3	--	--	--	--	3

*Must describe level of the course.

(1)Chem 101 has both lecture & recitation --two entries required.

The above data are more or less "design" data. In addition, the following information reflecting the actual situation should be available for each section of each course currently being offered.

(1) Type of instruction (classroom, lab, other)

(2) Hours per week

(3) No. of students enrolled in the section.

DISCUSSION

DATA REQUIREMENTS FOR PROGRAM ANALYSIS

FACILITIES DATA

The facilities data required are indicated in The Higher Education Facilities Classification and Inventory Procedures Manual. In summary the data required about each room are:

a. Organizational Unit to which the room is assigned.

b. Room Type

c. Function

d. Area - in assignable square feet

e. Number of Stations - where appropriate

DISCUSSION
DATA REQUIREMENTS FOR PROGRAM ANALYSIS
STAFF DATA

For purposes of facilities analysis and planning, only a subgroup of the total institutional staff need be considered. In particular, only those staff members requiring office space must necessarily be "inventoried." However, in the interests of thoroughness it is suggested that all institutional staff be included in the data file. The data required for each staff member are:

a. Organizational Unit

b. Position - The categories of positions are almost limitless. The WICHE Staff Data Elements Dictionary includes a limited number of categories. These categories and possible further aggregations are as follows:

1. Faculty Rank Categories

a) Teaching Assistant	Graduate Assistants
b) Research Assistant	
c) Teaching Associate	
d) Research Associate	
e) Lecturer	Regular Faculty
f) Instructor	
g) Assistant Professor	
h) Associate Professor	
i) Professor	

2. Support Staff Categories

a) Officers & Managers	Non-academic Professionals
b) Professionals	
c) Technicians	Technical
d) Craftsmen (skilled)	
e) Office & clerical	Office & Clerical

f) Operatives (semiskilled)
g) Laborers (unskilled)
h) Service workers
i) Apprentices

Other Support Staff

c. Appointment percentage - percentage of full-time employment

d. Requires office space - yes or no?

e. Breakdown of Activities for Faculty members - in particular

1) Distribution of effort among instruction, research, and public service.

2) Listing of course (section) assignments.

DISCUSSION
GENERAL PLANNING CRITERIA
A PROPOSED SYSTEM

INTRODUCTION

This section describes the use of general planning criteria, which are broad-gauge factors for the evaluation of institutional space requirements at system-wide or state levels for purposes of capital resource allocation.

Throughout these manuals, the emphasis is on the development of institutional-level facilities planning capability. The procedures and methodologies presented are designed specifically to aid institutional administrators in determining the capacities of the facilities currently available for use on their campuses and in projecting the additional facilities required by expected future developments. As a result of this institutional-level orientation, the methods are dependent on detailed data and place substantial emphasis on institutional policy. Successful and thorough planning at the institutional level requires both.

While the emphasis has been on institutionally-oriented methodologies and on procedures geared toward helping institutions accomplish detailed, internal planning, other methods of evaluating the end products must be available to those agencies responsible for obtaining or providing the resources necessary to implement these plans. No institution of higher education is an isolated entity; all must compete for limited resources in the same general arena. For public institutions and for those private institutions which are supported to a degree by public funds, the evaluation process is highly structured and operates through a coordinating council or some other state agency. For institutions seeking funds from private sources, the process is much more subtle, but just as real, and operates through philanthropic foundations, corporations, and private donors.

In either case, the final product of the detailed, institutionally-oriented procedures for projecting facilities requirements usually is evaluated by an external agency. This evaluation can take many forms. In its simplest form, the evaluation is a subjective judgment or a superficial comparison of the results of the projections of those institutions competing for the available funds. In those instances in which the process is highly structured (primarily where public funds are involved), the evaluation commonly takes the form of an independent calculation of the facilities requirements of each institution against which the institutional projections are compared. This calculation is generally based on a standardized, and necessarily more generalized, set of procedures and planning factors.

There are good and sufficient reasons why the procedures and factors developed by the individual states or by state higher education systems must be unique and tailored to their specific needs.

Statewide policies, objectives and philosophies concerning the conduct of higher education differ noticeably from state to state. It is potentially misleading for institutions to borrow planning standards from other, noncomparable institutions; it is equally inappropriate for statewide systems to borrow standards or norms from other states which have different patterns of institutional characteristics and instructional styles.

There should be an effort within each individual state to develop a planning system which reflects the higher education goals and policies and the unique array of institutional characteristics within that state's system of higher education.

In the past, standarized procedures and planning factors typically have been based on extensive analysis of historical data. From these data statewide averages were derived against which data from individual institutions were compared and evaluated. This approach is based on two very tenuous assumptions. First, it assumes that current or historical conditions provide the basis for developing standards to be carried forward into the future; it assures that the mistakes and inequities of the past will be perpetuated in the future.

Second, the use of averages masks interinstitutional differences. In essence, the dogmatic use of a single value such as the mean, which is calculated from a range of possible values, assumes that the variances around this single value are invalid. This failure to recognize the legitimacy of variance can work undue hardships on certain institutions. In summary, this approach serves to put the forward-looking planner in the rather awkward position of going through the world looking backward.

In the past, some state agencies and many institutions have placed an inordinate amount of faith in criteria based on averages of space and utilization data.

The primacy of the average has two unfortunate consequences. First, it focuses attention on a single value and draws attention away from the significance of the range of values which surround it on either side. Second, the use of averages can obscure the existence of some very important trade-off possibilities. The first consequence is especially important in the application of evaluative criteria on an inter-institutional basis. The second is particularly influential at the intra-institutional level.

Failure to recognize the nature of variance around the average has led to inconsistent application of many evaluative criteria. In those situations in which variations have been in the direction of less than average requirements for capital resources (less than average space needs or higher than average utilization), the variation is normally accepted without question. Conversely, when the variations have been in the opposite direction, acceptance is not so unquestionably forthcoming. In effect, variations in only one direction (the direction of less than average resource requirements) are recognized as having validity. The result is a strong tendency toward homogeneity. Every institution is forced to approximate the average or less, which may result in many kinds of unanticipated inefficiencies. Those institutions operating "below average" (in cost) tend to become more nearly average (and thereby more expensive). Those operating "above average" are forced toward the average (sometimes at the expense of the educational program). The savings obtained at the expense of those institutions operating "above average" may be more than offset by failure to realize savings from those institutions operating at or below the average. A thorough understanding of the nature of, and reasons for, the variations around the average could result in a distribution of an equal amount of resources in a way which more equitably recognizes the differing needs of different institutions.

Application of evaluative criteria in a way which does not accommodate the existence of trade-off situations in the long-run, may prove even more costly. Use of "average" criteria is normally on a room-type by room-type basis (i.e., the aim is to be "average" for each type of space rather than for the total for all types of space). Development of those innovative instructional techniques which result in a greater-than-average requirement for one type of space and a lesser-than-average requirement for a second type is stymied. More subtle is the situation in which a greater-than-average requirement for a particular type of space is substituted for lower operating expenses. The nature of the evaluative process in most instances, precludes use of such compensating variations. Rigidity in the application of evaluative criteria thus may effect lack of innovation as well as less-than-efficient operation. Promotion of innovation in both instruction and management requires acceptance of some degree of interinstitutional variation.

In order to overcome the deficiencies inherent in an evaluation process based on standards derived from historical data, it is necessary to construct individual statewide planning systems on the basis of what is desirable and necessary rather than on the basis of what is or has been. Such a construct requires that the affected parties, together, attempt to define the form of the system, investigate the problem areas associated with the use of historical data, analyze those situations in which institutional variations are apparent, and, in the end, reach some sort of consensus as to the details of an evaluation process which can be applied equitably in the future. The development of such a system requires compromise. It also requires openmindedness and the willingness to recognize the need of all parties for a product which is both sensible and fair.

As indicated previously, the form of such a statewide system logically will vary from state to state. However, several basic requirements must be satisfied before any such constructed system can operate effectively and to the desired end.

The basic requirements which must be satisfied are:

- The process must be more generalized than that which is applied at the institutional level. It is a waste of time and resources to attempt to duplicate an institution's planning process outside of the institutional setting. The evaluative process must be based on the consideration of a smaller number of independent variables.

- The process must allow for those legitimate differences which exist between institutions and which result in differing facilities requirements. Any system which is based on a single, fixed criterion for each type of space for all types of institutions generally is inappropriate.

- The data elements included in the calculations must be defined very explicitly. In addition, the data must be available or readily derivable from those used by the institution for its ongoing planning and management operations.

- The process must be explicit regarding what is to be included and what is to be excluded. If the techniques which permit a general assessment of the requirements for some types of space are not available, this should be specifically noted.

In addition to these structural requirements, there are two fundamental, operational requirements:

First, the procedures must permit the institution which exceeds the limits set by state-agency criterion to present its own, more detailed data as the basis for justifying its deviation from the norm. This is not to suggest that the institution is always "right" in such situations; rather, it recognizes that no generalized planning or evaluative process can reflect all the nuances of the institutional situation and that complete dependence on an imperfect system is unwise and unwarranted. Accordingly, these evaluative processes should be used to define areas requiring further discussion rather than to provide a final, unilateral answer. Further, where "excesses" occur, the institution must be granted sufficient time and resources to "correct" these such situations.

Second, it must be acknowledged that general planning criteria used in the evaluative process cannot be applied to the design of specific facilities. There must be some allowance for flexibility since no gross indicator is sufficiently sensitive to reflect varying requirements created by differing programs, philosophies, modes of operation, functions to be served, and architectural considerations. A stipulation that the actual amounts of the various types of space within a building, as designed, agree with those derived by the application of general planning criterion can do nothing but hinder the creation of a facility which is tailored to an institution's particular needs. The stewardship function can be sufficiently excercised that the total amount of space in a building be within the limits set. Concern with the pieces is unnecessary.

Finally, in both the development and use of the generalized planning criteria, emphasis should be placed on protecting institutional incentives for excellence and innovation while maintaining the degree of control consistent with the stewardship role being performed. Such incentives can be provided by allowing institutional administrators to divert resources made available through extraordinary efficiencies of operation in one area to improvement or experimentation in other areas. There should be a reward, not punishment, for superior performance.

In an effort to illustrate the form of a system of generalized planning criteria which meets the requirements outlined above, a proposed system is presented on the following pages. Because the requirements of the various users may differ from this system, it is suggested that it not be adopted for use without careful analysis and possible modification. It is intended as a starting point for further development. It should be indicated, however, that the form of this particular system and the quantitative values recommended have been developed by individuals most knowledgeable concerning "the present state of the art" in the field of facilities planning. The use of quantitative values substantially different from those presented requires extensive analysis of institutional program requirements and a thorough understanding of their interrelationships.

DISCUSSION
GENERAL PLANNING CRITERIA
GENERAL FORM OF THE SYSTEM

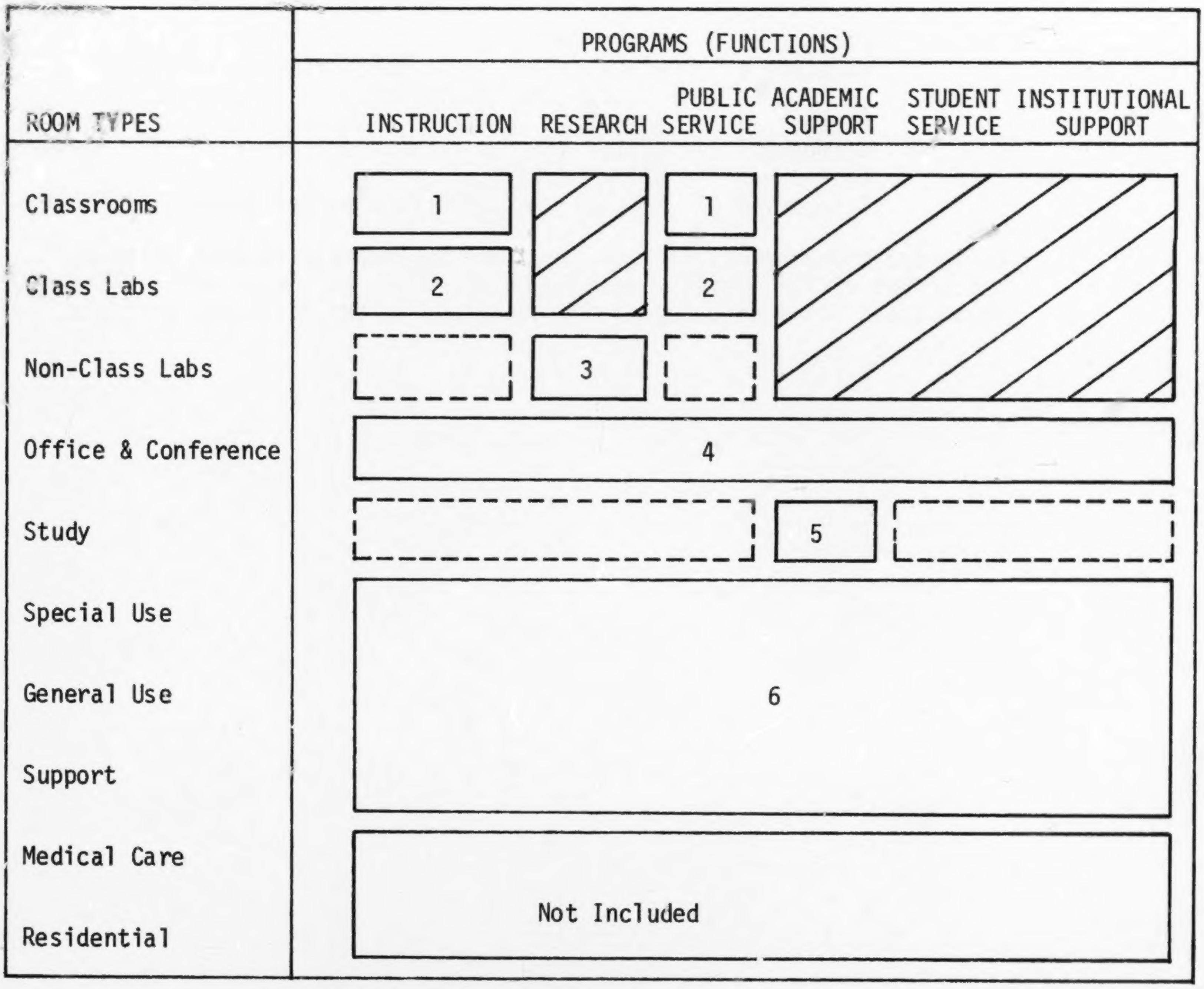
DISCUSSION:

The general framework for the system proposed herein is constructed of two elements, room types and functions. While room type is the basic element in the system, there is sufficient variation created by the interaction of room type and function to make addition of function not only useful but necessary. The inclusion of the function element in combination with room type serves to create an array which can serve as a checklist to insure that none of the necessary space is omitted. This, in itself, is sufficient justification for recommending that function be made an integral part of the system's structure.

In order to have a generally usable system, it is necessary that this framework be constructed of commonly-defined elements. The room type categorization used here is that contained in the Higher Education Facilities Classification and Inventory Procedures Manual and the function categorization corresponds to the programs defined in the WICHE Program Classification Structure: Preliminary Edition (1970). Table 5.1 is an array of room types versus functions (programs) as categorized in these two documents. The numbered boxes represent the six types of space with which the system deals specifically. They also serve to describe the basic interrelationships between room types and functions.

TABLE 5.1

INTERRELATIONSHIPS BETWEEN ROOM TYPES AND PROGRAMS



ROOM TYPES	PROGRAMS (FUNCTIONS)					
	INSTRUCTION	RESEARCH	PUBLIC SERVICE	ACADEMIC SUPPORT	STUDENT SERVICE	INSTITUTIONAL SUPPORT
Classrooms	1	▨	1	▨	▨	▨
Class Labs	2	▨	2	▨	▨	▨
Non-Class Labs	----	3	----	▨	▨	▨
Office & Conference	4					
Study	----			5	----	
Special Use	6					
General Use						
Support						
Medical Care	Not Included					
Residential						

KEY:
——— Primary Relationships
---- Secondary Relationships
▨ No Relationships (Generally)

As is indicated on Table 5.1, the proposed system, in essence, is confined to consideration of six distinct space type categories. In summary these are:

Category 1 - Classrooms
Category 2 - Class Laboratories (Including individual study and special class laboratories)
Category 3 - Non-Class (Research) Laboratories
Category 4 - Office and Conference Facilities
Category 5 - Study Facilities
Category 6 - Special Use, General Use, and Support Facilities

Different forms of planning criteria are appropriate to each of these categories of facilities. Detailed discussions of the planning criteria recommended for each category are contained in the following sections.

SPACE CATEGORY 1: CLASSROOMS

SUGGESTED FORM OF THE GENERAL PLANNING CRITERION:

- Assignable Square Feet per Weekly Student-Hour of Classroom Instruction (ASF/WSH)

RATIONALE:

This particular planning criterion is suggested since weekly student-hours are a more representative indicator of classroom activity than any of the alternatives.

A general planning criterion of assignable square feet per full time equivalent student (ASF/FTE student) is also a useful approach since the additional step of calculating weekly student-hours can be eliminated. However, since the classroom load generated by a full-time equivalent student can vary substantially from one institution to the next, this criterion is not appropriate for use in situations which require comparable data.

APPLICATION OF THE GENERAL PLANNING CRITERION:

In reality, the suggested planning criterion of assignable square feet per weekly student-hour of Classroom Instruction is a composite of three elements:

$$\text{ASF/WSH} = \frac{\text{(Assignable Square Feet per Station)}}{\text{(Room-Utilization Rate)} \times \text{(Station Occupancy Ratio)}}$$

$$\text{ASF/WSH} = \frac{\text{(ASF/N)}}{\text{(RUR)} \times \text{(SOR)}}$$

The quantitative values of each of these elements are variable, within limits, from institution to institution.

The extent of and reasons for the quantitative variations within each element are:

a) Assignable Square Feet per Station (ASF/N).

Architectural and circulation considerations dictate that, on the average, classrooms with fewer stations require more floor area per station. A rough rule of thumb for calculation of the assignable square feet per station for a single classroom is expressed by the following equation.

$$ASF/N = (9) + (240)/(N)$$

where N is the number of stations in the room.

Application of this equation yields the following results:

ASF/N = approximately 21 assignable square feet per station for a room with N = 20 stations

ASF/N = approximately 17 assignable square feet per station for a room with N = 30 stations

ASF/N = approximately 15 assignable square feet per station for a room with N = 40 stations

ASF/N = approximately 12 assignable square feet per station for a room with N = 80 stations

ASF/N = approximately 11 assignable square feet per station for a room with N = 120 stations

Accordingly, institutions which have a higher proportion of small classrooms (normally the small institutions) will have a higher average station area than do institutions which have a greater proportion of larger rooms.

The average station area values for all classrooms at an institution generally should fall in the range of 14 to 18 assignable square feet per station (ASF/N).

b) Room Utilization Rate (RUR).

The number of hours of room use per week typically varies from 25 to 30 hours of daytime use per week. Within this range, the higher rates typically are achieved by the larger institutions. At the smaller institutions, the higher incidence of potential course conflicts usually creates a requirement for somewhat more flexible scheduling. In turn, this results in an overall room-utilization rate which tends to approach the lower end of the range.

A range of 25 to 30 hours of daytime use per week should be appropriate for all but the most unique institutions.

This suggested range of 25 to 30 hours per week of classroom use is based on what is considered a normal operating week of from 40 to 44 hours. Institutions which operate at a higher level of use do so by including non-peak hours of use in the normal operating week. It is not feasible to assume that all institutions can operate efficiently and optimally at a rate higher than 30 hours per week. Therefore, higher rates of use are not recommended, although it is recognized that some institutions can and do achieve them.

c) Station-Occupancy Ratio (SOR).

Typical values of the station-occupancy ratio fall within the range of 0.55 to 0.67. The exact value achieved at a given institution is influenced by the degree to which the distribution of section sizes conforms to the distribution of station-counts. There is also a trade-off between the room-utilization rates (RUR) and the station-occupancy ratio (SOR). If the room-utilization rate is particularly high, it is probably achieved by putting small classes in large rooms, thereby reducing the station-occupancy ratio. Conversely, if the station-occupancy ratio is especially high, it is probably achieved by allowing lower room-utilization rates to occur. Similarly, the station-occupancy ratio is affected by the distribution of station-counts (i.e., it is more difficult to maintain a consistently high station-occupancy ratio in large rooms).

As a result of such considerations, legitimate variations in the values of the station-occupancy ratio between institutions must be acknowledged. Average values in the range of 0.55 to 0.67 should be deemed acceptable.

By combining the values which represent the limits of each element, an ASF/WSH value of 0.70 ASF/WSH* is attained at one extreme and 1.31 ASF/WSH** at the other.

However, as was noted previously, there are certain trade-offs involved which prevent an institution from achieving maximum values for each element (e.g., if high values of station-occupancy ratio are achieved, lower values of room-utilization rate normally result). As a result, neither of these extremes are common.

It is suggested that values of ASF/WSH in the range of 0.80 to 1.20 are most appropriate. The exact value (or range) appropriate for a given institution depends on the particular characteristics of that institution.

COMMENTS:

Classrooms have a variety of uses in addition to those associated with degree-program instructional activities. In particular, many public service activities such as short courses and symposiums require classroom space (as indicated in Table 5.1). As a result, the equivalent weekly student-hours generated by these other programs should be included in the total weekly student-hour figure which is used to calculate the space required.

An allowance for classroom service space (e.g., coat rooms and preparation rooms) is included in the factors.

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*$0.70 = \frac{(14)}{(30) \times (.67)}$

**$1.31 = \frac{(18)}{(25) \times (.55)}$

SPACE CATEGORY 2: CLASS LABORATORIES (Including special and individual study labs)

SUGGESTED FORM OF THE GENERAL PLANNING CRITERION:

- Assignable Square Feet per Weekly Student-Hour of Class Laboratory Instruction (ASF/LWSH)

RATIONALE:

This particular planning criterion is suggested since weekly student-hours of laboratory instruction (LWSH) is the most accurate indicator of the level of activities requiring instructional laboratory facilities. In particular, it is responsive to variations in the class laboratory load generated by full-time students at different institutions. As a result, this criterion is appropriate for use in situations involving interinstitutional comparisons of comparable data.

APPLICATION OF THE GENERAL PLANNING CRITERION:

Instructional class laboratory facilities are not readily interchangeable among academic programs nor among levels of course within a single academic program. As a result, the ASF/LWSH factor must be applied at the level of course within each program rather than at the institutional level.

The quantitative values of each of the elements which comprise this criterion [Assignable Square Feet per Station (ASF/N), Room-Utilization Rate (RUR), and Station-Occupancy Ratio (SOR)] vary either by academic program or by level of course. The extent of these variations and the reasons for their occurrence are discussed in the following paragraphs:

a) Assignable Square Feet per Station (ASF/N).

The nature of the furnishings and equipment required is the source of variation in class laboratory station areas. Equipment requirements will vary both by academic program and by level of course. When the proposed requirements vary by level of course, it is because the upper division courses usually require more assignable square feet per station than do lower division courses. This greater station area requirement stems from the need to provide space for the more specialized equipment.

Table 5.2 contains ranges of values for ASF/N which vary according to academic program and course levels. The academic programs conform to the discipline categories which are contained in *The Taxonomy of Instructional Programs in Higher Education*. The suggested levels of course are lower division undergraduate and upper division undergraduate with graduate level courses included in the latter category.

TABLE 5.2

ASSIGNABLE SQUARE FEET PER STATION (ASF/N) FOR CLASS LABORATORIES BY ACADEMIC PROGRAM AND LEVEL OF COURSE (INCLUDING CLASS LABORATORY SERVICE)

ACADEMIC PROGRAMS	ASSIGNABLE SQUARE FEET PER STATION	
	LOWER DIVISION	UPPER DIVISION AND GRADUATE
Agriculture & Natural Resources	60-70	60-70
Engineering	50-90	75-125
Architecture & Environmental Design	55-65	85-95
Biological Sciences		
Fine & Applied Arts		
Home Economics		
Physical Sciences		
Psychology		
"Lab" Social Sciences (Geography, Anthropology, etc.)		
Communications	35-45	55-65
Education (excluding Physical Education)	30-50	30-50
Area Studies	25-35	25-35
Business & Management		
Computer & Information Sciences		
Foreign Languages		
Letters		
Library Science		
Mathematics		
Military Science		
Public Affairs & Services		
"Non-Lab" Social Sciences (History, Political Science, etc.)		
Interdisciplinary	*	*

*Values for "interdisciplinary" courses may be obtained by combining factors of the various academic programs from which the interdisciplinary subject is derived.

TABLE 5.2 (conclusion)

ASSIGNABLE SQUARE FEET PER STATION (ASF/N) FOR CLASS LABORATORIES BY ACADEMIC PROGRAM AND LEVEL OF COURSE (INCLUDING CLASS LABORATORY SERVICE)

TECHNICAL - VOCATIONAL	
ACADEMIC PROGRAMS	ASSIGNABLE SQUARE FEET PER STATION
Business & Commerce Technologies	25-35
Printing, Photography, & Graphic Arts	55-65
Hotel & Restaurant Management	55-65
Transportation & Public Utilities	125-175
Data Processing Technologies	50-80
Health Services & Paramedical (except Physical Therapy)	40-60
Physical Therapy	90-110
Mechanical & Engineering Technologies (except Graphics & Drafting)	120-160
Graphics & Drafting	55-65
Natural Science Technologies	40-60
Public Service Related Technologies	25-35

b) Room-Utilization Rate (RUR).

Variations in the room-utilization rate are related primarily to level of course, to certain academic programs, and to the ability to schedule multiple sections of one course.

The variation by level of course is attributable to two phenomena. First, upper division courses normally require a greater amount of non-scheduled use because students in these more advanced courses are expected to spend more time pursuing special research interests than are students enrolled in the more basic lower division courses. Second, there is often a definite need for very specialized advanced courses which generally enroll small numbers of students. Typically, the enrollment in the course will vary from year to year. In spite of a low room-utilization rate, the room which serves this course is required by the academic program and must be made available as long as that program is offered. These general planning criteria deal with averages, and, on the average, facilities serving upper division courses, because of their specialized nature, are used fewer hours per week.

It is suggested that the room-utilization rate for facilities housing lower division courses should be in the range of 22 to 26 hours per week of daytime scheduled use with the more prevalent value being 24 hours per week. The room-utilization rate for class laboratories which house upper division courses should be in the range of 14 to 18 hours per week of daytime scheduled use with 16 being the more common value.

Obviously, the room-utilization rate also will vary by academic program. For academic programs in which little specialized equipment is required and in which little non-scheduled activity is found (e.g., class laboratories for Area Studies, Business and Management, Computer and Information Sciences, Mathematics, some Social Sciences (such as History, Philosophy, Economics, and Political Science), and similar academic programs) the room-utilization rate should approach 30 daytime hours per week. Moreover, in programs in which a great deal of specialized equipment is used and in which the students are expected to use the facilities on a non-scheduled basis, it is not unusual to find room-utilization rates of less than 20 hours per week, even at the lower division level (e.g., class laboratories for Architecture, Landscape Architecture, Planning, Fine Arts, Foreign Languages, Library Science, and similar academic programs).

c) Station-Occupancy Ratio (SOR).

Variations in the station-occupancy ratio are also primarily related to level of course. For lower-division courses, the station-counts of class laboratories are much less diverse than are the station-counts for classrooms. In addition, class laboratory section sizes normally are tailored to the capacities of specific laboratories. As a result, there is generally a uniformly high correlation between section size and station-count for class laboratories at the lower division level.

At the upper division there is usually only one class laboratory serving a very few sections of one or two courses. Yearly enrollment variations cause the station-occupancy ratio to be high one year and low the next for these more specialized facilities. On the average, the station-occupancy ratio for upper division courses will be significantly lower than it is for lower division courses.

It is suggested that the station-occupancy ratio for lower division class laboratory courses should be in the range of .75 to .85, and the station-occupancy ratio for upper division class laboratory courses in the range of .55 to .65.

Because of the exremely large number of possible combinations of values of the three elements combined in the assignable square feet per weekly student-hour (ASF/WSH) factor, no ranges for the overall factor are recommended.

COMMENTS:

Class laboratories have a variety of uses in addition to those associated with degree-program instructional activities (e.g., public service program short courses, student and faculty research, and experimental demonstrations). The class laboratory weekly student-hours generated by these other activities must be considered also when class laboratory space requirements are being calculated.

Allowances for service areas such as preparation rooms, chemical storage rooms, and laboratory apparatus storage rooms, are included in the factors.

SPACE CATEOGRY 3: RESEARCH & GRADUATE TRAINING FACILITIES
(Non-Class Laboratories)

SUGGESTED FORM OF THE GENERAL PLANNING CRITERION:

- Assignable Square Feet per Faculty Engaged in Research
- Assignable Square Feet per Head-Count Graduate Student Engaged in Research

RATIONALE:

The facility requirements for research and graduate training, in large measure are generated by the equipment necessary to the operation of such programs. Because it is impossible to measure equipment space requirements, it is necessary, therefore, to establish substitute indicators. The indicator which can serve best as the proxy for equipment is the number of individuals who use the equipment. Faculty members and graduate students involved in research represent the most appropriate basis for a general planning criterion.

APPLICATION OF THE GENERAL PLANNING CRITERION:

The requirements for research and graduate training facilities vary significantly among academic programs. As a result these variations must be reflected in the factors which are used. Suggested values for assignable square feet per person (Faculty or Graduate Students) involved in research are presented in Table 5.3. Implicit in this criterion is the recognition of the fact that a substantial amount of this type of space is required to permit a faculty member to initiate a research project. Once this initial amount of space has been provided, a limited but specific number of graduate students can be accommodated with no increase in space. However for each additional graduate student in excess of these stated limits, an incremental amount of space is required.

TABLE 5.3

GENERAL PLANNING CRITERIA FOR RESERACH SPACE

ACADEMIC PROGRAM	ASSIGNABLE SQUARE FEET PER FACULTY ENGAGED IN RESERACH	NUMBER OF HEAD-COUNT GRADUATE STUDENTS ACCOMMODATED IN THE ASSIGNABLE SQUARE FEET PROVIDED FOR EACH FACULTY MEMBER	ASSIGNABLE SQUARE FEET PER GRADUATE STUDENT ENGAGED IN RESEARCH IN EXCESS OF STATED LIMIT
	ASF/FACULTY	HEAD-COUNT GRADUATE STUDENTS	ASF/GRADUATE STUDENT
Agriculture & Natural Resources Engineering Biological Sciences Physical Sciences	900-1300	4	200-250
Architecture & Environmental Design Fine & Applied Arts Home Economics Psychology Communications	600-900	4	150-200
Education Area Studies Business & Management Computer & Information Sciences Foreign Languages Letters Library Science Mathematics Public Affairs & Services Law Theology	150-200	8	40-50

COMMENTS:

The application of these criteria produces total research space requirements. This research space, however, need not be necessarily in the form of non-class laboratories. For many academic programs (e.g., letters, social sciences, etc.) the requirement may be for additional office type research space. Although the calculation was couched in terms of non-class laboratories, there is absolutely no reason for restricting research and graduate training activities to a single room type classification. Augmentation of office facilities is often a logical consequence.

The term faculty is meant to exclude teaching research, and other types of graduate assistants (whose numbers are accounted for in the graduate student category). Individuals engaged in post doctoral types of research activities should be treated as if they were faculty.

SPACE CATEGORY 4: OFFICE AND CONFERENCE FACILITIES

SUGGESTED FORM OF THE GENERAL PLANNING CRITERION:

- Assignable square feet per full time Equivalent Staff Requiring Office Space (ASF/FTE Staff)

RATIONALE:

The requirements for office and conference room facilities are determined almost entirely by the number of individuals to be provided with office space. It is possible to establish office and conference space requirements by calculating the amount needed by a selected sub-group of the staff (e.g., faculty and non-academic professionals) and imputing from this figure the amount required by all other staff. However, this practice carries with it an implied assumption about the institution's staffing patterns and the ratios between numbers of employees of different categories (e.g., faculty vs secretarial and clerical). Since variations among institutions in such ratios should be expected, it is recommended that total numbers of staff requiring office space be determined for each institution and the general planning criterion be applied to this total figure.

This approach has an added benefit in that it forces decisions as to which categories of staff will be provided with office space and what the staffing policy shall be.

APPLICATION OF THE GENERAL PLANNING CRITERION:

The general planning criterion for office and conference facilities has been developed to avoid the question of which employees or groups of individuals are entitled to office space. This is an institutional policy decision. It should be noted specifically that this criterion is designed to be applied to those employees requiring office space in all programs and organizational units of the institution.

The quantitative values of the general planning criterion vary by type of institution (university vs. four-year vs. two-year) and by organizational unit within the institution. In general, the office space requirements per person in non-academic units are greater than those in academic units because of greater requirements for file storage, waiting rooms, other office service areas, and conference facilities. The office and conference space requirements per person in non-academic organizational units are approximately the same for all types of institutions.

The values of the general planning criterion for academic units, however, do vary by type of institution. The more complex the institution and the more varied the faculty member's activities, generally, the greater are his requirements for office space. As a result, the per person requirements are greatest for universities, somewhat less for four-year institutions, and least for two-year institutions.

It is suggested that the following values of the general planning criterion for office and conference are reasonable:

TABLE 5.4

OFFICE AND CONFERENCE FACILITIES GENERAL PLANNING CRITERIA

ORGANIZATIONAL UNIT	TYPE OF INSTITUTION	ASSIGNABLE SQUARE FEET PER FULL-TIME EQUIVALENT STAFF REQUIRING OFFICE SPACE
Academic Units	University	140-170 ASF/FTE Staff
	4-year	125-150 ASF/FTE Staff
	2-year	110-130 ASF/FTE Staff
Non-Academic Units	All institutions	140-170 ASF/FTE Staff

COMMENTS:

These values also include allowances for office service, conference room, and conference room service types of facilities.

There need be no differential values of the criterion for different groups of employees. Although faculty and professional staff usually are given larger offices and generate requirements for conference space, the other groups of employees create the demand for most office service facilities. The factors thus tend to even out.

Office requirements for faculty who engage in non-laboratory research (historians, linguists, and economists, for example) are the sum of an office space and a research space requirement. Their offices consist of a module which has been generated by their office needs and a module generated by their non-laboratory research needs. For inventory purposes these offices, though consisting of two, separately generated components, usually are counted as an office. The federal inventory scheme does allow for a proration of such space if desired.

SPACE CATEGORY 5: STUDY FACILITIES

SUGGESTED FORM OF THE PLANNING CRITERIA:

- Stack Space: Assignable Square Feet per Bound Volume (ASF/Bound Volume)
- Study (Seating) Space: Assignable Square Feet per Station (ASF/Station)
- Library Service Processing Space: Percentage of Stack Space plus study space

RATIONALE:

Historically, generalized planning for library facilities has been dependent upon a combination of the three criteria listed above. The format of these criteria is widely accepted and, for all intents and purposes, undisputed. Therefore, there seem to be no compelling reasons for developing substitutes.

In a more positive vein, these criteria do treat the three primary generators of library space requirements (books, users, and library processing) in a comprehensive manner, further justifying their continued use.

The proposed format for study facilities planning criteria contains one very significant deviation from the usual historical approach. It is recommended that office space requirements in the library be calculated in accordance with the procedures suggested for office facilities, in other organizational units, which is assignable square feet per full time equivalent staff requiring office space. Accordingly, service space includes only such things as card catalogues, circulation desks, binderies, etc. The percentage of study and stack space devoted to service space defined in this more limited way is therefore much smaller than the values historically used (e.g., 20 to 25%).

APPLICATION OF THE GENERAL PLANNING CRITERIA:

a. Stack Space:

Values for this factor almost universally range from 0.0833 to 0.10 assignable square feet per volume. If "volume" is arbitrarily defined as a bound volume, the single value of 0.10 assignable square feet per volume is appropriate. This stems from the observation that those institutions which have succeeded in achieving a value less than 0.10 ASF/volume have done so by calculating the number "equivalent" volumes for such things as newspapers, microfilm, maps, etc. However, if only bound volumes are considered and the transformations to volume equivalents are omitted then the appropriate factor is 0.10 ASF/Bound volume. Use of this particular factor implies some assumptions concerning the mix of library resource types. However, the calculation of volume equivalents is so complex as to be inappropriate as a required step in a generalized planning system.

b. Study (Seating) Space:

A value of 25 to 30 assignable square feet per station for library study space is appropriate for most institutions. However, a higher value for library study space may be acceptable in those instances where private study cubicles are provided for faculty and/or graduate students.

The number of stations to be provided in relation to the total user population is a policy decision to be made at the institutional level.

c. Library Services Processing Space:

It is recommended that a value of 5% of the combination of the stack area and study area be used as the basis for calculating library service space. As it was noted previously, it is proposed that library office space requirements be calculated independently and not be included within the library processing space category.

If library office space is not calculated separately, then the combined office and other library processing area will range from 20% (for large libraries) to 25% (for smaller libraries) of the sum of the study and stack assignable square feet.

COMMENTS:

Institutions frequently are locating a larger proportion of their study space outside of the library building (e.g., 15% of the student body may be seated in the library and an additional 10% elsewhere on campus). As a result, the criterion for seating space should be viewed in an institution-wide context which gives recognition to all institutional programs and functions.

SPACE CATEGORY 6: SPECIAL USE, GENERAL USE, AND SUPPORT FACILITIES

ROOM TYPES INCLUDED:

•Special Use:	Armory, Athletic-Physical Education, Audio-Visual, Clinic (non-medical), Demonstration, and Field-Service Facilities
•General Use:	Assembly, Exhibition, Food, Health (Student), Lounge, Merchandising, and Recreation Facilities
•Support:	Data Processing and Computer, Shop, Storage. Vehicle Storage, Central Food Store, and Central Laundry Facilities.

SUGGESTED FORM OF THE PLANNING CRITERION:

Percent of the Total Academic and General Space at the Institution (The combination of Special Use, General Use, and Support Facilities assignable square feet should represent 30 to 40% of the total assignable square feet in Space Categories 1 through 6.*)

RATIONALE:

Within this category are a large number of different types of space. No single one of these space types can be related firmly to a readily-measureable variable within the institution. Rather, the assignable square feet of these space types available or required by an institution is determined by the institution's philosophies, organizational structure, and operating style.

In addition, there are certain trade-offs which are evident among the space categories lumped together here. For example, lounge and recreation space may be reduced in order to acquire more athletic facilities or additional assembly facilities.

For a given space type in this category, comparison of inventory data from various sources confirms that there is a great deal of variation from institution to institution. However, these same comparisons reveal that, when these three space types are considered as a single category, there is relatively little variation in the percentage from institution to institution. It is suggested therefore, that this phenomenon be recognized and used to advantage in developing criteria for these types of space.

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*Space categories 1 through 6 of this document include all Room Type Codes 100 through 700 in the Higher Education Facilities Classification and Inventory Procedures Manual.

This approach has the added benefit of promoting institutional individuality, initiative, and styling while also maintaining control over total facilities resources requirements.

APPLICATION OF GENERAL PLANNING CRITERIA:

It is suggested that a value of 30 to 40% of academic and general space (Space Categories 1 through 6) is appropriate for this particular criterion.

The exact value for a specific institution is dependent on the size of the institution as well as the proportion of the students residing on-campus.

In general, the smaller institutions require a higher percentage of their space be devoted to these kinds of facilities than do the larger institutions. This stems simply from economies of scale, there are usually efficiencies in larger scale operations. Moreover, specific institutional operations and activities such as most indoor physical education activities require standard amounts of space.

Also, the greater the proportion of on-campus residents, the greater has been the provision of such facilities. Although the relationship is not necessarily causal, it has been demonstrated historically. Typically, resident students have a greater need for these space types in the general use category than do non-resident students.

As a result, the large institution with few resident students should be able to achieve a value which approximates 30% while the small institution with a high proportion of resident students may require of 40% or slightly more.

SUMMARY
GENERAL PLANNING CRITERIA
A PROPOSED SYSTEM

DISCUSSION:

The material presented in this section represents an attempt to define a system of generalized planning criteria which is appropriate at a system-wide or state level. These criteria also are appropriate for limited, rule-of-thumb type, institutional applications. Within this proposed system, all types of space for which requirements can be evaluated on a comparable basis are treated.

The notable omissions from this sytem are medical care facilities and residential facilities and associated food service facilities. The rquirements for these types of facilities vary in the extreme from one institution to the next. Moreover, medical facilities generally house "super" research operations and in every instance require special treatment. In the main, the number of students who must be housed and fed is determined by factors which partially are beyond institutional control. In particular, the requirements are determined largely by the institution's location and the ability of the surrounding community to provide an alternative source for these services. Institutions located in large cities may be required to provide few, if any, supporting services. On the other hand, institutions situated in isolated, rural areas may have to provide the full range of services to the entire student body.

Historically, facilities which house auxiliary enterprise operations have been excluded from statewide or system-wide facilities planning and evaluation efforts. This has occurred because the revenue-financed nature of these operations has allowed them to be administered relatively independently.

However, the ability to finance the construction of these facilities solely on the basis of revenue received from their operation is decreasing. More and more, they are being considered as an integral part of the institution's physical plant and are competing for capital funds on the same basis as other types of facilities. The ability of an institution to attract sufficient students to meet its projected enrollment growth may well be determined by that institution's ability to provide certain basic services. As a result, planning for such facilities should be an integral part of the facilities planning process at the institutional level. Regular evaluation of such facilities at the state level on the same basis as the evaluation appropriate for other types of facilities is probably unwarranted. Involvement of state-level agencies in the decision-making processes related to construction of such facilities, however, is warranted. While these facilities purposefully are not included in the proposed system, their influence and importance should not be forgotten.

DATA REQUIREMENTS:

One of the objectives of any system of generalized planning criteria should be that it produce the desired results, but that it require a minimum of readily-available, uniformly-defined data. The following list is a summary of the basic data required as inputs to the system described on the previous pages:

1) Full-Time Equivalent Students

2) Weekly Student-Hours of Classroom Instruction

3) Weekly Student-Hours of Laboratory Instruction (by academic program and level of course)

4) Full-Time Equivalent Faculty Engaged in Research (by academic program)

5) Head-Count Graduate Students Engaged in Research (by academic program)

6) FTE Staff Requiring Office Space (by organizational unit)

7) Number of Library Volumes (Bound or Volume Equivalents)

8) Number of Library User stations to be provided.

9) Number of Academic and General Assignable Square Feet (by type of space)

SYNTHESIS

THE FACILITIES PLANNING CYCLE

INTRODUCTION:

This section describes the overall context of college and university facilities planning and the processes by which the specific techniques of evaluation and projection are applied in the development and implementation of comprehensive master planning.

Previous sections of the manuals have dealt with the technical and procedural aspects of both program planning and facilities planning. The steps to be followed in evaluating the current capacity of an institution's future requirements for facilities have been described and illustrated in detail. This section describes the synthesis of these detailed program and facilities projections into a comprehensive master plan and the continuing processes of facilities planning, programming, development, implementation, and management.

The first part of the discussion focuses on three basic dimensions of the "master planning" process:

- The formulation of longer-range goals and objectives
- The projection of program development and levels of activity implied by these goals and objectives
- The estimation of the facilities resources required by the projected programs and levels of operation
- The preparation of a facilities development program, a site plan, and a capital funding program

The second part of the discussion focuses on the processes of program implementation and facilities management, specifically;

- Building programming
- Design development
- Space management

While the aspects of these two elements are separated for discussion purposes, in reality they are highly interrelated, interactive parts of a continuing process. Just as planning and analysis go hand-in-hand, so do the processes of planning, programming, and implementation. To plan without having the implementation of the plans as an ultimate goal turns planning into an academic exercise. To implement without benefit of the direction provided by planning is, at the very least, inefficient. It is in the processes of programming and implementation that refinements, revisions, and updating of plans occur; thus, implementation functions to make planning a meaningful, continuous process.

SYNTHESIS
THE FACILITIES PLANNING CYCLE
THE PROCESS OF MASTER PLANNING

DISCUSSION:

The term "Master Plan" is used here to connote a comprehensive statement of institutional goals, the expected nature and timing of institutional development, and the estimated manpower, fiscal, and facilities resources required to attain the development goals and objectives.

Some form of "Master Plan" is required by most state governments and many foundations before capital facilities funds are appropriated. Increasingly, the scope and content of the Master Plan are spelled out in detail and procedures for amending the plan are established. Many states have laws which require that updating and revision of the Master Plan be accomplished according to a fixed timetable. For example, the New York State legislature requires revisions to the Master Plans of both the State University of New York and the City University of New York every four years. For institutions which are not faced with such explicit requirements, a new cycle of master planning is often initiated when previous versions of the institution's plans no longer are credible to potential benefactors; a fund raising compaign committee often provides the impetus for a renewed planning effort.

Theoretically, the process of master planning should be basically an exercise in academic program planning; facilities logically is the last of a long series of interconnected steps.

1. GOALS AND OBJECTIVES

Nearly all published material, which deals with the subject of planning, lists setting of goals and objectives as the first step in the process. At the core of any master planning process must be a conceptual structure of future institutional development which normally is expressed in terms of concrete statements regarding such factors as:

- Programs to be offered by the institution
- Curriculum and teaching methods
- General enrollment levels and the sub-populations from which the study body will be drawn

- The place of sponsored research
- The philosophy of the institution with regard to public services extended to individuals and groups within the institution's community
- The quality of the cultural and physical environment

In the absence of a conscientious review of these various elements, program planning becomes nothing more than an insensitive projection of the past into the future, without direction and without recognition of changing conditions.

The concrete expression of goals and objectives takes the form of specific assumptions (e.g., student retention rates, student mix, faculty teaching loads, class size distributions, instructional methods) required for program planning and the conversion of program plans into facilities requirements. This fact should be recognized clearly, and the assumptions should be made explicit and related to the broader goals and objectives.

2. ENROLLMENT PROJECTIONS

Once this broad conceptual structure on which all planning is based has been developed, the more quantitative aspects of the master planning process can begin. Historically, the first of these more quantitative steps is the development of enrollment projections in which numbers of students and certain primary characteristics of the total student body are projected for several years (commonly 5 or 10) into the future. Several alternative projections may be made which reflect different assumptions about the future.

3. PROGRAM PLANNING

Given these enrollment projections, the next step in the master planning process is to follow through with the program planning procedures (presented in Section 2.0 of this manual). In particular, instructional loads in each of the institution's academic programs and staffing requirements for all organizational units must be projected on the basis of each of the sets of projected enrollment data. Only after the conceptual structure has been developed and the myriad detailed procedures of the program planning process have been carried through to completion can the facilities planning process begin.

4. FACILITIES PLANNING

Stated in oversimplified terms, the objective of the facilities planning process is to estimate the amount of each of the various types of space required to accommodate the projected level of activity within each of the institution's programs. Viewed in another context, facilities planning can be interpreted as a process by which the amount of one set of resources required by an institution's programs are estimated. In this respect financial and facilities planning are similar, over-lapping processes. Just as the objective of financial planning is to predict the level of operating funds required to support projected levels of activity, the objective of facilities planning is to predict amounts of physical (capital) resources. Illuminating the role of facilities planning in this particular light may help to insure that it is perceived as an integral part of the overall planning process rather than as an independent set of procedures.

In general, the outputs of the facilities planning procedures required for purposes of developing the comprehensive master plan are the projected total amounts of each type of space required by each department or organizational unit within the institution. There is no need, at this rather gross level of planning, to deal with such things as the distribution of station-counts of classrooms. An estimate of the total classroom space required usually is sufficient for longer range projections. The more distant the projections (e.g., 20 to 40 years for land use and land acquisition planning), the more general the projections can be (e.g., total academic and general assignable square feet per full-time equivalent enrollment).

Detailed procedures for facilities planning have been presented in Manuals Two through Five. Since great amounts of detail generally are not required for master plan purposes and since various alternatives (of enrollments, for example) usually must be investigated, long-range institutional planning can use general (versus detailed) methods. However, as is frequently emphasized in these manuals, the general planning criteria appropriate for use at a particular institution can be determined only after the detailed procedures have been employed. Therefore, the institution starting a new cycle of comprehensive master planning must invest the time and effort necessary to carry out the detailed procedures if any stock is to be placed in the results obtained. Once the detailed procedures have been carried through, an understanding of how they can be converted to generalized planning factors should be developed. Then the detailed procedures need be used only for purposes of updating and revalidating the general planning criteria every few years.

An additional benefit of developing more general institutional planning factors is that they may be used for analyzing the long-range implications of alternative courses of action. An essential characteristic of any planning system is the ability to respond quickly to "what if" kinds of questions and to assess the long-range costs and consequences of changes in programs or institutional goals. In order to limit to manageable levels the volume of data and mathematical operations required for such analysis, the detailed projections should be converted to more generalized planning factors, expressed in program and level of instruction categories appropriate for the institution.

Master planning seems to run in five or ten year cycles of intensity. At these points in time the institution experiences peak activity related to the planning of facilities--but these peaks are a normal consequence of the nature of the planning cycle and should be treated as such. Such peaks should not be considered a signal for undertaking a crash program. Facilities planning must be recognized as a cycle in which broad plans are established, these plans are implemented in discrete pieces (many of which call for variations from the broad plan), and then new master plans are generated which reflect both new projections of the future and the realities of the past which have led away from the paths originally charted. The planner must recognize the rhythmic pattern of these procedures and schedule the planning activities accordingly.

5. FACILITIES DEVELOPMENT PROGRAM

The program planning and facilities projection procedures should yield the estimated facilities requirements for each organizational unit within an institution. The next step in the facilities aspect of the master planning process is the preparation of a facilities development program.

The inputs to the facilities development program are the facilities requirements projected on the basis of the procedures presented in these manuals. First, these projections must be aggregated into identifiable building units. This process takes different forms at different institutions. At some, it may be deemed desirable to construct facilities to house specific organizational units, while at others buildings may be constructed which house a single major type of facility (e.g., research laboratories). Practices are so variable as to prevent specific description of a "best way" or a "recommended procedure". In general, the process should follow these steps:

1) Use the general planning methods to project future amounts of each of the different major types of facilities required by each organizational unit.

2) Compare these projections with the existing inventory of facilities on both a room type and an organizational unit basis. At this point, develop a schedule of demolition of any existing facilities that are physically obsolete.

3) On the basis of this comparison, determine the additional amount of space required of each type and for each organizational unit, deducting space to be lost because of demolition of physically obsolete facilities.

4) Through the established decision-making processes of the institution, planning assumptions must be made regarding the organizational units that will move to new facilities in the planning period versus those that will be assigned to existing facilities.

The process which bridges the gap between projected facilities requirements and future building projects defies precise description, primarily because the decisions involved are subjective, not objective. In practice, it is unusual to find a situation in which only the additional facilities required by a particular organizational unit are included in a new building. More commonly a building is constructed which is designed to meet the total facilities requirements of one or more organizational units for a specific number of years into the future (i.e., the building includes an allowance for projected additional facilities requirements as well as replacements for existing facilities). This practice starts a long chain of facilities reassignments on the campus in which some departments move into a new facility and other organizational units expand into the space vacated by those departments blessed with new buildings.

The decision as to which organizational units are assigned space in new buildings and which units must be content to have their facilities requirements met through expansion into additional space in older facilities is based on a host of institutional considerations. Without doubt, intra-institutional "political" considerations are very significant in such decisions. Academic unit heads or deans who develop greater influence, through whatever means, may be more likely to get the new facilities. Similarly, the availability of funds for certain purposes plays a significant role in the determination of how the additional facilities are to be provided. The influence of the federal government's emphasis on science facilities in the 1960's determined many new building priorities.

Without doubt, political clout and the availability of funds are prime determinants of the form of a future construction program. It must be recognized, however, that the decisions are not made solely on the basis of these two factors. Other considerations which enter into the decision-making process are the personal prejudices and preferences of the institution's administration, the nature and convertibility of the institution's existing facilities. and the availability of space on which to build buildings in certain sectors of the campus. To illustrate the latter point, physical relationships between facilities may make it more appropriate to build a new law building somewhere on campus and convert the existing law space for use by departments of arts and letters. Such a decision could reflect a situation in which the law school could be located at a remote part of the campus whereas the faculty of arts and letters should be centrally located to serve all the various needs of the institution.

There is no way to develop an exhaustive list of all the considerations which enter into such a decision. Nor is there any way of describing the way in which these various considerations are interrelated, weighed one against another, and applied to make the final decision. Decisions such as these reinforce the contention that institutional administration is still very much an art rather than a science. At this point suffice it to say that these decisions must indeed be made and that they can be made only at the institutional level.

At the end of this complex and rather mysterious process, the projected facilities requirements of an institution will have been conceptualized in terms of future buildings. In addition the occupants of these future buildings as well as the occupants of the space to be vacated by those moving into the new facilities will have been identified.

6. SITE PLANNING

It is at this stage of the facilities planning process, and not before, that the site planning specialist and the landscape architect can be of service. Once the process of assigning space, both existing space and space to be constructed, to the various organizational units has been completed, the remaining task is to develop a site plan for the campus. Site planning requires that the assignable square feet be converted to gross square feet of building, that an initial configuration of the building be proposed (e.g., single story to high rise), and that a location for the new facilities be proposed.

Development of a site plan normally includes consideration of the following:

- Evaluation of land requirements

  How well can the existing land holdings (or a proposed campus site) accommodate the projected building gross development requirements? Ground coverage and building height densities, along with consideration of walking distances, parking requirements, and circulation needs, must be studied and evaluated to determine long-range land acquistion policies.

- Land use planning

  Building location by functional groupings and other land uses (parking, playfields, circulation, open space) are evaluated in terms of efficient land use, design character, environmental qualities, and effective circulation and communications.

- Special site planning studies

  Special studies typically are made of utilities requirements and locations; traffic, parking, service, and pedestrian circulation; articulation of the campus with the surrounding community; landscaping development; and the economics of land acquistion.

In simple terms, site planning is the process by which the map of the campus is revised to indicate the disappearance of any buildings scheduled for demolition and the appearance of the projected new buildings and other physical facilities.

To summarize, at the completion at the chain of procedures which comprises the total process of facilities master planning, the institutional planner has available that information which tells him the nature and extent of the facilities requirements of each of the institution's organizational units, the proposed assignment of these organizational units to buildings (either existing or to be constructed), and a site plan or map which indicates the general locations and spatial relationships of these buildings. In addition, there is sufficient data available to provide a more-than-adequate basis for making estimates of the costs of providing the facilities and the land called for by the master plan.

The completion of a master planning document is only the beginning, not an end unto itself. In fact, the real work doesn't start until the implementation phase is reached. It is one thing to dream, guess, and estimate; it is a far different thing to make these dreams, guesses and estimates come true.

The foregoing discussion describes the ideal sequence of steps: the setting of goals and objectives; academic and support program planning; projection of facilities requirements; determination of building facilities to be added, demolished, and renovated; and site planning.

Because of the long-range perspective associated with capital investment in land and buildings, the need to make decisions about land acquisition and building location often seems to initiate and dominate the planning process. When this need leads to the initiation of a comprehensive planning process, site planning can provide focus and structure around which in-depth program planning is organized. All too often, however, institutions have carried out expensive and elaborate site development design plans based on only the most superficial consideration of institutional goals and objectives, program development, and resource requirements. Failure to put facilities and site planning in the proper perspective (in the context of institutional program planning) entails the danger that costly commitments in buildings and land will be made on a wholly inadequate basis. Because of its visible, concrete nature, a site plan which identifies certain facilities with particular academic units or programs takes on the aura of a commitment subsequently difficult to alter. Unless the quasi-commitments implied in a site plan are based on careful specification of institutional goals and priorities, the ability to adapt the plan over time to changing goals, priorities, and realities is severely restricted.

7. CAPITAL DEVELOPMENT PROGRAM

The solidification of a site plan is insured when it becomes the basis for securing capital funds for its implementation. A capital development program must specify particular building and other facilities projects, their size, functions, and siting, estimated cost and relative priorities. Once a capital development program is promulgated, it becomes a long-term commitment, both to internal interests and to external sources of funds, that it will be carried out (at least as far as resources will permit).

Priorities, however, must be subject to change over time, both for legitimate and sometimes questionable reasons. The availability of funds for one type of building and the unavailability of funds for other types of facilities may compel revision of the priority order. Decisions to develop new programs or drop programs may alter capital development priorities.

Unanticipated opportunities that are judged to be advantageous and of enduring value to the institution must be acted upon. The master plan and capital development priorities should not be so rigidly held to that valuable opportunities are lost. On the other hand, a sound master plan and carefully deliberated capital priorities can provide the basis for resisting the pressures for involvement in programs that have great transient appeal but little lasting substance or value. The central reason for planning is to prevent the dilution of institutional resources and to insure that the central objectives of the institution will be fullfilled.

SYNTHESIS

THE FACILITIES PLANNING CYCLE

IMPLEMENTATION AND MANAGEMENT PROCESSES

BUILDING PROGRAMMING

As a preliminary condition to securing capital resources, it usually is necessary to develop a detailed program for the building or other facility for which funds are being sought.

A building program typically should contain the following information, based on the application of the detailed planning methods outlined in Manuals Two through Five:

1. Programs and organizational units to be accommodated in the facility.
2. Detailed listing of the amounts of each type of space.
3. Functional relationships between the various program components and space units.
4. Basic guidelines for building configuration and relationships to site.
5. Utility requirements of the various space units.
6. Fixed and moveable equipment requirements (usually detailed at a later stage).
7. Detailing of preliminary project development cost estimates.

The information required for building programming requires a degree of understanding that can be acquired only through the application of the detailed planning methods. Once the occupants of the building have been specified, the amounts of each type of space required should be determined on the basis of detailed projections of program development and levels of activity. While there is a strong temptation to allow the intended occupants to design the building, more rigorous program planning and facilities specification is increasingly required for justification to the funding agencies. This increases the importance of user participation in the planning and programming of building facilities, because intense involvement of the users of the facility is essential to provide the inputs to the detailed planning procedures and to insure the functional viability of the facility.

Building programs, therefore, should be written by a committee including representatives of the proposed users (faculty and staff). The staff and user representatives that form a particular building committee should be charged with overseeing the planning of the building all the way from preparation of the program through design development to construction.

DESIGN DEVELOPMENT

Design development is the process by which the general requirements of a building as expressed in the building program are translated into a detailed set of plans. This process requires that the building committee and the project architect work together to:

1. Specify the type and size of each of the individual rooms to be included in the building.
2. Specify the location of each of these rooms in relation to all other rooms to be included (i.e., establish a preliminary set of floor plans for the building).
3. Specify the utility service requirements for each of the rooms.
4. Determine furniture and equipment requirements and, in the case of fixed equipment, specify its location within each room.
5. Designate construction materials for use throughout the building.
6. Develop the proper aesthetic and environmental sense of the facility.
7. Develop increasingly more detailed cost estimates for the building.

Since the situation seldom arises in which the building as first designed is within the initial budget, this process is necessarily iterative. The pressures are normally intense in both directions; those pressing for reduction in scope of the facility to bring it within the budget and those pressing to increase the budget to allow construction of the most desirable building possible. The result is usually a compromise. Some space is cut out, substitution of materials are made, some furniture and equipment es eliminated. On the other hand, additional sources of funds are normally sought in order to allow inclusion of elements deemed absolutly necessary.

In summary, the creation of design development plans requires a great deal of negotiation between the future occupants and users of the space and those responsible for obtaining and managing the resources necessary for its construction. The fact that changes in the preliminary plans must be expected is further argument for use of a building committee which includes representatives from the group which will ultimately occupy the space. The adjustments in the initial design phases cannot be accomplished without the aid of the users. When reductions are required, it is the user who must establish his priorities and identify those pieces which can be eliminated with the least effect on the specific programs.

The final result of this process is a detailed set of working drawings and specifications for construction of the building.

SPACE MANAGEMENT

The completion of a new building typically sets off a chain reaction of relocation and the reallocation of space on the campus. The new occupants of the building usually are vacating space that, after necessary remodeling, will be assigned to other organizational units. In turn, the space vacated by these may be reassigned to still other programs.

This is the kind of circumstance that brings into play the skills of space management. The planning and programming of relocation and remodeling should parallel the planning and design of the new facility. Those responsible for planning the reallocation of space must apply the detailed planning and space programming methods to all of the organizational units or programs that potentially will be affected by the changes in space assignment. The decisions of which units will be reassigned to what facilities and how much can be allocated to renovation requires a considerable amount of trial and error, negotiation, and compromise.

New space is constructed in a configuration which is, at least initially, matched to the requirements of the new occupants. However, the configuration of space in existing facilities is, to a large extent, fixed unless extensive remodeling is done. Since funds for remodeling seem to be more difficult to secure than funds for new construction, attempts usually are made to fit new occupants into older facilities with the least possible change.

Given the constantly changing facilities requirements of the different organizational units within an institution, the stage is set for the very difficult task of managing the institution's facilities resources in an optimum manner. At almost all institutions an administrator responsible for space allocation is faced with a steady stream of requests for more space or for different types of space for the different organizational units on campus. In the face of these requirements (or demands) the individual charged with making decisions regarding space assignments needs all the direction he can get.

The master plan aids in the decision-making at this level in two ways. First, the capacities of existing facilities can be determined through use of the detailed facilities planning processes. The validity of a department's request for additional space can be evaluated on the basis of these calculations. Such information indicates the relative importance of the requirements from the various requesting departments and provides a basis for establishing priorities.

The master plan not only aids in establishing priorities relating to space management problems, it also helps in making decisions about the solutions to these problems. The space management problems should be approached from the viewpoint that, insofar as possible, the solutions to current problems will result in movement toward the ultimate goals outlined in the master plan. For example, if the English department is currently located in building A and has reached the point where additional space is required, and if the master plan indicates that the ultimate goal is for this department to be located in building B, then expansion space for the department should first be sought in building B. Although it may well be impossible to move toward the ultimate goal without many detours and intermediate steps, the initial attempt at solving the problem should take the form of movement toward the goal established in the master plan.

Just as the realities of the situation can result in revisions in the construction program of an institution so can the realities of a situation result in changes to the master plan in areas which affect daily space management problems. Because of the timing of other factors, situations may arise which make concurrence with the master plan impossible. For example, a department may grow larger than originally projected thus generating space needs which exceed the amount of space allotted in the master plan. When such situations arise, there is no choice but to rework the Master Plan and re-establish the base on which the operational decisions are made.

As funds for new construction have become increasingly limited, the space management process has become increasingly important. More intensive review of space needs and more careful space budgeting is essential. In many institutions, the justification of space needs has become part of the operating budget request procedure.

The space management problem is compounded by the tendency for departments to be highly possessive of the buildings they occupy, especially if the faculty feels they were instrumental in securing funds for "their" facility. Even if there is an excess of space not immediately required by the primary occupants, there is strong resistance to permitting other organizational units to use the space, even on a temporary basis.

Some institutions have had to formally proclaim that all building facilities are institution-wide resources, subject to allocation in the same manner as general operating funds. This requires a formally established procedure for evaluating space requirements and justifying space needs. The space management process then becomes a means of updating the master plan, since short-run management decisions are tested against longer-range goals and objectives on a continuous basis.

SUMMARY

The general planning methods are those which are most useful at the master planning level. Great amounts of detail not only are not required, but may in fact hinder, this process. Conversely, at the implementation stage, use of the detailed methods is almost mandatory. In programming new buildings and reassigning existing space it is necessary to know all those things which the detailed planning methods (but not the general methods) can provide--such things as station-count distributions of required classrooms, numbers and types of staff requiring office space, and so forth.

Because of the use of the detailed planning methods in conjunction with the implementation activities, there are a limited number of situations in which these methods must be employed across the board. Instead, they are used selectively to determine requirements for either one or two types of space or for a limited number of organizational units. An institution which is starting from the beginning and building a completely new campus to house a new student body must use the detailed procedures for all types of space and for all organizational units. Once the detailed methods have been applied, more general indices can be developed for the institution and can be updated from time-to-time by the application of detailed procedures on a selective basis.

Implicit in the previous discussion is the notion that it is through the everyday efforts toward implementing the Master Plan that it becomes a living document. Through continued use, the problem areas and variations will be found and, one-by-one, revised and corrected. While the need remains to review thoroughly the comprehensive plan every five or ten years and to take a hard look at its basic tenets, the daily use and revision of the plan will keep it sufficiently accurate to be a useful tool and to avoid the need to start from ground zero each time a new master planning cycle is initiated. Deviations from the orginal plan must be expected--to have none would mean that the developers were blessed with unlikely perfect foresight. The presence of these deviations should serve as a device to prompt review, not as an excuse for invalidating the entire document. The causes for variation should be sought and adjustments made where necessary. If decisions must be made which cause deviations from the plan, so be it. It will still have served its purpose by forcing a thorough review of the implications prior to final action. More fundamentally, it provides a mechanism and a structure by which these implications _can_ be investigated.

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